United States Court of Appeals

for the

District of Columbia Circuit

TRANSCRIPT OF RECORD

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Court of Appeals, District of Columbia

OCTOBER TERM, 190

367

No. 1563.

JOSHUA H. MILLETT, SAMUEL G. REED, AND THE CROSBY STEAM GAGE AND VALVE COMPANY, APPELLANTS,

vs.

F. I. ALLEN, COMMISSIONER OF PATENTS.

APPEAL FROM THE SUPREME COURT OF THE DISTRICT OF COLUMBIA

FILED JUNE 2, 1905.

COURT OF APPEALS OF THE DISTRICT OF COLUMBIA.

OCTOBER TERM, 1905.

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INDEX.

	Original.	Print.
Caption	*a*	1
Bill	1	1
Answer	10	7
Replication	13	8
Depositions for complainant	13	8
Deposition of Joshua H. Millett	16	10
William T. Johnson	22	13
Thomas R. Freeman	29	17
Joshua H. Millett	36	20
Samuel G. Reed	60	33
Frederick Lane	116	63
Paper Exhibits—Specifications and drawings Nos. 18129, 219,735, 232,432, 267,416, 273,591, 310,490, 395,279, 485,961, 643,876 (omitted in printing)	127	—
Cowper's specifications (partly omitted in printing)	158	75
Complainant's Exhibit Transcript of Record (omitted in printing)	183	—
Opinion of Court of Appeals	228	76
Memorandum as to Defendant's Exhibit 1	229	79
Stipulation as to proof	230	79
Opinion of court	231	80
Decree, appeal, and penalty of bond fixed	239	85
Memorandum: Deposit made in lieu of appeal bond	240	85
Præcipe for transcript	240	85
Clerk's certificate	242	86
Stipulation as to printing record	243	86
Stipulation as to printing record	244	87

JUDD & DETWEILER (INC.), PRINTERS, WASHINGTON, D. C., AUGUST 3, 1905.

In the Court of Appeals of the District of Columbia.

JOSHUA H. MILLETT ET AL., Appellants,
vs. } No. 1563.
F. I. ALLEN, Commissioner of Patents.

a Supreme Court of the District of Columbia.

JOSHUA H. MILLETT, SAMUEL G. REED, and The Crosby Steam Gage and Valve Company, Complainants,
vs. } No. 23126. In Equity.
F. I. ALLEN, Commissioner of Patents.

UNITED STATES OF AMERICA,
District of Columbia, } *ss:*

Be it remembered, that in the supreme court of the District of Columbia, at the city of Washington, in said District, at the times hereinafter mentioned, the following papers were filed and proceedings had, in the above-entitled cause, to wit:—

1 *Bill.*

Filed February 8, 1902.

In the Supreme Court of the District of Columbia, the 8th Day of February, 1902.

JOSHUA H. MILLETT, SAMUEL G. REED, and The Crosby Steam Gage and Valve Co., Plaintiffs,
vs. } No. 23126, Eq. Doc. 52.
F. I. ALLEN, the Commissioner of Patents, Defendant.

To the supreme court of the District of Columbia holding an equity court:

The plaintiffs state as follows:

1. Said Joshua H. Millett, is a citizen of Malden, in the Commonwealth of Massachusetts; said Samuel G. Reed is a citizen of Rockland in said Commonwealth; said Crosby Steam Gage and Valve

Company is a corporation duly organized under the laws of said Commonwealth and having its usual place of business at Boston in said Commonwealth.

Said Millett and Reed bring this suit as joint inventors and joint applicants, and said Crosby Steam Gage and Valve Company brings this suit as the assignee of the invention of said Millett and Reed; all as hereinafter more fully set forth.

2. The defendant F. I. Allen, is the Commissioner of Patents of the United States of America, a citizen of the United States, and an official resident of Washington in the District of Columbia, and he is sued in this action in his official capacity as such Commissioner.

2 3. That said Millett since the year 1875 (with the exception of two weeks in the year 1881) has been and now is president, and thoroughly advised as to the affairs, of said company; and sincd the year 1892 has been actively engaged in conducting the business of said company and fully acquainted with the operations going on at its factory in said Boston.

4. That said Reed has been in the employ of said company since December, 1895; and since August, 1898, said Reed has been the superintendent of the company's factory, which position he now holds.

5. That said company was incorporated in the year 1875 and since that date has been and now is the manufacturer of standard appliances, including particularly steam gages, steam engine indicators and valves, having its principal place of business in said Boston as aforesaid and having branch offices in New York city and in Chicago, in the United States, and in London, England, and having its factory in said Boston, employing in said factory many men; that said company is the owner by assignment of numerous letters patent of the United States relating to the standard appliances manufactured by said company and covering inventions of its employés and of others; that certain of its employés are constantly engaged in experimenting with a view to improving the devices which said company is making, and that said company is constantly protecting such improvements by letters patent of the United States.

6. That heretofore, and before June 12, 1899, the said Joshua H. Millett and Samuel G. Reed were the original, first and joint inventors of the improvement in Bourdon tube springs employed in
steam or pressure gages, hereinafter more fully described, not
3 known or used by others before their invention or discovery
thereof, and not patented or described in any printed publication in any country before their invention or discovery thereof, or more than two years prior to their application for a patent therefor, and not in public use or on sale for more than two years prior to their application for a patent therefor, and not abandoned; and that no application for patent on said improvement has been filed by them or their representatives or assigns in any country, foreign to the United States.

7. That the improvement in Bourdon tube springs invented by said Millett and Reed as aforesaid consists in providing a new and useful means of connecting by threaded engagement the ends of a Bourdon tube spring within a gage; one end to the "tubular head" (that part of the gage which is attached to the steam boiler), the other end to the registering mechanism of the gage. The invention consists in, or is the result of, taking a piece of ordinary brass tube of commerce and turning it, with the exception of its ends, in a lathe to a thickness adapted to the uses intended in a pressure gage. The ends of the tube are left of their original thickness and are cut by a taper thread for attachment to the tubular head and registering mechanism as aforesaid. The tube is then flattened throughout the turned portion, and curved to the form required. By means of these taper threads a joint is secured which is both firm and tight, though no solder is used, even when subjected to a very high degree of heat and steam pressure.

8. That prior to this invention of Millett and Reed the Bourdon
tube spring employed in all steam gages was a brass tube of
4 uniform thickness flattened throughout its length; and it
was the custom to attach the flattened ends of this tube to the tubular head of the gage and to the registering mechanism of the gage by fitting one end of the tube over a projection of the tubular head, and the other end of the tube over a tip connected with the registering mechanism, and then soldering the joints. This process is satisfactory where the steam pressure is low and the tube itself protected against the introduction of steam. But when the gage is attached to a locomotive boiler, or to any other boiler, furnishing steam under high pressure, there is required a tube with a correspondingly stronger joint and a joint which can be made without solder; for it has been found by experience that solder can not be used if subjected to the severe heat accompanying the high pressure of the steam.

9. During many years the said company has interested itself in experiments to discover a device for, or method of, attaching the Bourdon tube spring to the tubular head and registering mechanism of a pressure gage without the intervention of solder; many experiments being made under the direction of the Frederick Lane, hereinafter referred to, and of said Millett and Reed; but none of their efforts in this direction were successful until said Millett and Reed invented the device described in said application, which they aver is in every way novel and useful and most satisfactory.

10. That said Millett and Reed, having perfected their said inven-
tion, did on June 12, 1899, duly file in the Patent Office at
5 Washington a complete application for letters patent of the
United States therefor, serial number 720,288; that the claims contained in said application were rejected by the primary examiner; that thereupon said Millett and Reed did on January 16, 1900, duly file in said Patent Office a second complete application for such letters patent, serial number 1,660; said second application being a

continuation of said first application; and that the claims contained in said second application were rejected by the primary examiner; that thereupon said Millett and Reed did on February 17, 1900, duly file in said Patent Office a third complete application for such letters patent, serial number 5,620; said third application being a continuation of said first application; and that the claims contained in said third application were rejected by the primary examiner, and are as follows:

(1.) In a steam gage, the Bourdon tube and the part to which it is secured, the joint between the two being unsoldered and held solely by frictional contact as explained.

(2.) In a steam gage, the Bou-don tube and the part to which it is secured, the joint between the two being unsoldered and held by frictional contact as explained.

(3.) In a steam gage, the Bou-don tube and the part to which it is secured, the joint between the two being unsoldered and held by a frictional binding screw-joint connection as explained.

(4.) In a steam gage, the Bourdon tube and the part to which it is secured, the joint between the two being unsoldered and tapering as explained.

6 (5.) In a steam gage, the Bourdon tube D, having the threaded tapered end, *d*, in combination with the head C, having the correspondingly threaded tapered opening, c^2, as explained.

(6.) A Bourdon tube, having a reduced elastic portion and enlarged or reinforced threaded ends, in combination with a gage case having threaded portions which engage the threaded ends of the tube.

(7.) The Bourdon tube, D, having the reduced elastic body portion, d^2, and the enlarged or reinforced end portions, in combination with the gage case having correspondingly threaded portions.

11. That said Millett and Reed duly assigned their said invention to the said Crosby Steam Gage and Valve Company by two assignments, one assignment being dated June 10, 1899 and duly recorded in said Patent Office in Book H. 59, page 397; the other assignment being dated February 14, 1900 and duly recorded in said Patent Office in Book C 61 page 142.

12. That said Millett and Reed duly appealed from the decision of the primary examiner rejecting the claims contained in said third application; and duly pursued their several appeals, appealing finally to the Court of Appeals of the District of Columbia.

13. That said Court of Appeals of the District of Columbia finally rejected the said application for letters patent and affirmed the decision of the Commissioner of Patents refusing to issue letters patent; said decision being dated May 21, 1901.

7 14. That said Court of Appeals of the District of Columbia in its opinion affirming the decision of the Commissioner of Patents as aforesaid used the following language (96 O. G. 1241)—

"If there was in fact a soldering in the device mentioned or shown in the Lane patent, and such soldering rendered that device essentially different from the invention of the appellants, it ought not to have been difficult to adduce some evidence of the fact."

15. That the Court of Appeals of the District of Columbia affirmed the decision of the Commissioner of Patents as aforesaid *solely* on the ground that the Lane patent *in its drawings* showed the device of said Millett and Reed.

16. That the Lane mentioned in said opinion of the Court of Appeals of the District of Columbia is Frederick Lane of said Malden and is now, and has been since April 1893, in the employ of the said Crosby Steam Gage and Valve Company, being now, and having been since November 1896, assistant superintendent of the company's factory; that the Lane patent referred to in said opinion of the Court of Appeals of the District of Columbia is dated February 20, 1900 (No. 643,876); that the invention of said Lane covered by said patent was duly assigned by said Lane to said company at the time said Lane applied for letters patent therefor; and that said letters patent were issued to said company as assignee of said Lane.

17. That said Lane's invention relates to an *hydraulic gage* and embodies a *steel tube;* that said Lane neither mentions nor suggests,
either in his specification or drawings, the invention of said
8 Millett and Reed; further that the "usual tube spring" re-
ferred to by Lane in his specification (page 1 lines 48 and 49)
means the *steel tube spring* then in use and made with a *cylindrical* end threaded and adapted for an engagement which must be secured and strengthened *by solder.*

18. That said pressure gage invented by Millett and Reed is going into general use; that the sales thereof have been large and are steadily increasing; and that the demand therefor is continually growing greater.

19. That the plaintiffs in this action are entitled to the relief provided by section 4915 of the Revised Statutes of the United States, having complied in all respects with the requirements of said act, and being otherwise entitled thereto.

Wherefore your orators pray that this honorable court may adjudge and decree that your orators, the said Millett and Reed, are the first, original and joint inventors of the invention set forth and claimed in their said application; and that your orator, the said Crosby Steam Gage and Valve Company, is the owner of such invention and is entitled according to law to receive a patent for the said invention as specified in the claims of the said application; or for any part thereof as the facts in the case may appear.

And may it please this honorable court to grant unto your orators a writ of subpœna directed to F. I. Allen, the Commissioner of Patents of the United States commanding him to appear and answer to this bill of complaint and to do and receive what to this honorable court may seem meet in the premises.

9 And may it please this honorable court to grant unto your orators such other relief as may be proper in the premises. And your orators will ever pray.

JOSHUA H. MILLETT.
SAMUEL G. REED.
CROSBY STEAM GAGE & VALVE CO.,
By JOSHUA H. MILLETT, *President.*

W. H. SINGLETON,
RALPH W. FOSTER,
Solicitors and of Counsel for Complainants.

BOSTON, *February* 6, 1902.

COMMONWEALTH OF MASSACHUSETTS, *Suffolk*, } *ss:*

Then personally appeared the within named Joshua H. Millett and Samuel G. Reed and being severally sworn did severally on oath depose and say that they had read the bill by them subscribed and knew the contents thereof before subscribing the same and further that the contents thereof are true, and that the facts therein stated upon their personal knowledge are true and that those stated upon information and belief they believe to be true—

Before me—

RALPH W. FOSTER,
Notary Public.

[SEAL.]

10 COMMONWEALTH OF MASSACHUSETTS, *Suffolk*, } *ss:*

BOSTON, *February* 6, 1902.

Then personally appeared the within named Joshua H. Millett, president of the Crosby Steam Gage and Valve Companт, and, as such president and on behalf of said company, being duly sworn, did on oath depose and say that he had read the bill by him subscribed as such president and knew the contents thereof before subscribing the same and further that the contents thereof are true, and that the facts therein stated upon his personal knowledge are true and that those stated on information and belief he believes to be true.

Before me—

RALPH W. FOSTER,
Notary Public.

[SEAL.]

Answer of Defendant.

Filed November 25, 1902.

In the Supreme Court of the District of Columbia.

JOSHUA H. MILLETT, SAMUEL G. REED, and the Crosby Steam Gage and Valve Co., Complainants,
vs.
F. I. ALLEN, the Commissioner of Patents, Defendant.
No. 23126. Equity Docket No. 52.

11 To the honorable the justices of the supreme court of the District of Columbia:

The Answer of the Defendant, F. I. Allen, Commissioner of Patents, to the Bill of Complaint of the Above-named Complainants.

Defendant now and at all times hereafter saving and reserving unto himself all and all manner of benefit of exception which may be had or taken to the manifold errors, imperfections, and uncertainties of the said bill of complaint, for answer thereunto or to such parts and so much thereof as he is advised that it is material or necessary for him to make answer unto, answering says:

1. The defendant admits that he is the Commissioner of Patents of the United States of America, a citizen of the United States, and an official resident of Washington, in the District of Columbia.

2. Defendant further answering denies that the said Joshua H. Millett and Samuel G. Reed, were prior to January 12, 1899, or at any other time, the original, first, and joint inventors of the improvement in Bourdon tube springs employed in steam or pressure gages, as set forth in paragraphs 6 and 10 of complainants' bill of complaint herein, and he alleges that all the material parts of the devices set forth, shown, and described in the application for patent, No. 5,620, filed February 17, 1900, were, prior to the alleged invention thereof by the said Millett and Reed, fully set forth, described and shown in letters patent of the United States and Great Britain, as follows, to wit:

12 Ashcroft, September 8, 1857, No. 18,129; pressure gauge;
Kayser, September 16, 1879, No. 219,735; pressure gage;
Allison, September 21, 1880, No. 232,432; coupling for tubes;
Fulton, November 14, 1882, No. 267,416; gage cock;
Patterson, March 6, 1883. No. 273,591; tube coupling;
Atwood & Slate, Jan. 6, 1885, No. 310,490; gage cock;
Jurgens, December 25, 1888, No. 395,279; thermometer;
Maule, November 8, 1892, No. 485,961; long joint coupling;
Lane, February 20, 1900, No. 643,876; pressure gage;
British patent to Cowper, No. 12,889 of December 5, 1849.

All of which are on file in the records of this office, as by the said records or by duly certified copies of the same, ready in court to be produced, will fully and at large appear.

3. The defendant further answering says as to the matters contained in paragraphs of the bill of complaint numbered, respectively, 1, 3, 4, 5 and 18, he has no knowledge or information sufficient to form a belief as to the truth of the matters therein alleged, and he therefore denies the same and leaves the complainants to make such proof thereof as they shall be advised.

Defendant further answering denies each and every allegation contained in the said bill of complaint not herein and hereby well and sufficiently denied, traversed, and avoided, or confessed. All of which matters and things he is willing to prove, as to your honors may seem meet, and prays to be hence dismissed with his reasonable costs and charges in this behalf most wrongfully sustained.

FREDERICK I. ALLEN,
Commissioner of Patents.

Sworn to and subscribed before me, this 25th day of March, 1902.

A. M. BUNN,
[SEAL.] *Notary Public.*

13 *Replication.*

Filed April 10, 1902.

Supreme Court of the District of Columbia.

JOSHUA H. MILLETT, SAMUEL G. REED, and THE CROSBY STEAM Gage and Valve Co., Plaintiffs,
vs.
F. I. ALLEN, the Commissioner of Patents, Defendant.

The plaintiff joins issue with the defendant.

W. H. SINGLETON,
Solicitor for Plaintiff.

Depositions for Complainants.

Filed November 26, 1902.

Evidence for Complainants, Taken Pursuant to the Sixty-seventh Rule of the Supreme Court of the United States, in Equity, as Amended, Before me, Chas. M. Reed, Special Examiner.

BOSTON, MASS., *June 9th*, 1902.

Present: William H. Singleton, Esq., and Ralph W. Foste
14 Esq., counsel for complainants. John M. Coit, Esq., counsel for defendant.

(It is agreed that an order may be entered at any time appointing Charles M. Reed, Esq., a notary public of Boston, Massachusetts special examiner, *nunc pro tunc*, for taking said testimony)

(It is agreed by counsel for both parties that Patent Office printed copies of the specification and drawings of all United States patents which either of the parties may desire to offer in evidence shall have the same force and effect as if the original patents or fully certified copies had been offered instead of the ordinary printed copies, and the same stipulation is made of printed copies of all foreign patents, if such printed copies be official)

(Complainants' counsel files as evidence before the examiner, and hereby gives notice of such filing to the adverse party, the original assignment from Joshua H. Millett and Samuel G. Reed to the Crosby Steam Gage & Valve Co. its successors and assigns of the full and exclusive right to the invention set forth and described in the specification prepared and executed by them the 10th day of June, 1899 preparatory to obtaining letters patent of the United States therefor; said invention being set forth in an application filed in the Patent Office June 12th, 1899 and numbered 720,288 and the title of said invention being an improvement in pressure gages; said assignment bearing date June 10th, 1899 and the certificate of record attached to the assignment showing that it was received for record June 12th, 1899 and recorded in Liber H.
15 59, page 397, transfers of patents. And it is agreed by
counsel that the assignment need not be made an exhibit and defendant's counsel admits the due assignment from said Millett and Reed to the said Crosby Steam Gage & Valve Co. and the due recording of that assignment as alleged in the bill.)

(The same stipulation is made with regard to an assignment by said Millett and Reed to said company dated February 14, 1900, and recorded February 17th, 1900, in Liber C-61 page 142 transfers of patents. Said application being dated Feb'y 14, 1900 and numbered 5,620 and being a continuation of said first application.)

(The same stipulation is made with reference to an assignment by Frederick Lane to said company of an invention described in letters patent dated February 20th, 1900, numbered 643,876 and issued to said assignee, said assignment being dated January 10th, 1898 and recorded January 17th, 1898, in Liber P-56. page 354 of transfers of patents.)

(It is agreed by counsel for both parties that the printed copy of the "Transcript of record. Court of Appeals, District of Columbia, January term, 1901. Patent appeal docket No. 172 Filed January 22, 1901, (serial number 5602)" may be used by either party whenever the same may be desired instead of any original or certified copies of said record)

(It is agreed by counsel for both parties that the copy of the decision of the Court of Appeals for the District of Columbia
16 as printed in the Official Gazette August 6, 1901, page 1241
may be filed in lieu of certified copy, being the opinion of

the court in the case of Millett and Reed *vs.* Duell, Commissioner of Patents, in which the present application was involved.)

(It is further stipulated between the parties that the usual proceedings were had consequent upon this decision.)

(It is further stipulated by the parties hereto that either side may take testimony before any officer authorized to administer an oath either by consent or upon due and sufficient notice to the other side.)

Deposition of Joshua H. Millett.

Direct examination by RALPH W. FOSTER, Esq., of counsel for complainants:

Int. 1. Please state your name, age, residence and occupation and whether you are one of the complainants in this suit? Ans. Joshua H. Millett, 60 Malden, Mass., lawyer and president of the Crosby Steam Gage & Valve Co. of Boston. I am.

Int. 2. Will you briefly describe the Crosby Steam Gage & Valve Co.; its organization; its business; its history and its present status? Ans. The company is a Massachusetts corporation located in Boston, Massachusetts and was organized in 1875. It manufactures various implements or instruments connected with the use of water, 17 gas, steam and other fluids. It has stores for the distribution of its products located in Bosten, New York, Chicago, and in London, England. It is doing and has been doing a large business employing in its manufacture and sale of its production several hundred men.

Int 3. Is said company one of the complainants in this suit and if so please state what its interests is in the subject matter of said suit? A. It is as assignee of the invention set forth in the bill of complaint.

Int. 4. Do you know Samuel G. Reed, one of the complainants in this suit, and have you or said company any business relations with him? If so, will you briefly state what those relations are. A. I do. He has been employed by the company several years, first, as a mechanical engineer in the introduction of the goods to the public and second, as superintendent of the factory where he has been continually engaged since the summer of 1898 to the present time.

Int. 5. I intended to ask you to state how long you have been associated with said company and to give a short account of your present duties as well as your duties in the past? A. I have been associated with the company since its organization in 1875, having been president of it during that period except a few weeks in 1881. Prior to 10 years ago, while interested in its affairs I devoted only a portion of my time to its work. Since that time I have exclusively given my time to the affairs of the company. My duties have been of a general nature having the supervision of its entire af- 18 fairs but particularly interested on the mechanical side in the production and manufacture of its instruments.

Int. 6. Is Frederick Lane in the employ of said company and if so will you briefly state the history of such employment and describe his present duties? A. He is. He has been employed by the company for several years but since 1896 as assistant superintendent of the factory. He has immediate charge of the production of the goods.

Int. 7. State whether or not said company is the one mentioned in letters patent No. 643,876 dated Feb'y 20, 1900 covering an invention of said Lane and if so will you give the date of said assignment? A. It is and the date of assignment is Jan'y 10, 1898.

Int. 8. State whether or not said company has protected any of its standard appliances or manufacturers by letters patent and if so to what extent? A. It has to a very large extent. It encourages its employees to make improvements whenever possible in any of its productions and if patentable endeavors to protect them. On this account there have been taken out of the Patent Office of the United States a large number of letters patent which are owned by the company, embracing steam gages of various kinds, steam engine indicators, safety valves, recording instruments, whistles, valves of various kinds, recorders, and many others all of which can be seen upon examination of the catalogue of the company.

Int. 9. State what attention, if any, said company has given
19 to the manufacture of pressure gages and their improvement,
describing briefly the kind of gages and the general nature of the improvements? A. It has been interested in the making of pressure gages from the beginning, having been organized for the manufacture of pressure gages and safety valves It has always been interested in the production of such gages extending their use and endeavoring in every way to improve them. These gages have been in use for measuring the pressure of water, steam, air and other fluids, although chiefly for service under steam. A large number have been sold to railroads and manufacturing plants where high pressures of steam have been employed. A total production of several hundred thousand.

Int. 10. With reference to the improvement of the steam pressure gage, will you describe fully what has been done in that line, with special reference to the Bourdon tube spring employed in such gages? A. The only kind of gages which the company have been interested in making is of the Bourdon tube-spring type. At first when the pressure of steam generally used was considered low, or from 75 to 125 lbs. per square inch there was very little trouble in relation to the service which the tube spring gave in doing the work of the gage; but as the use of steam advanced the pressure per square inch increased until within later years it is not unusual to find it in common use of 220 to 225 lbs. per square inch. The attachment of the Bourdon tube-spring in steam gages has always been substantially by means of solder what may be called ordinary plumbers' solder, in order to make a tight

joint when connected to the pipe leading to the steam
20 boiler or to the end which conveys the movement of the
tube under pressure. When the tube-springs were subjected to low pressure steam, they were little affected on account of the heat thereof although it has been the custom and the requirement on the part of gage makers to interpose between the gage and the steam boiler some receptacle which would prevent the passage of the steam from the boiler directly in to the tube-springs of the gage to which it was attached; but when the steam pressure rose, the heat thereof became very much greater until under the highest pressures employed, the heat was sufficient to soften the solder used in attaching the tube-springs and thus cause them to leak or be destroyed, whenever by carelessness, accident or otherwise steam was permitted to enter them. The company as manufacturers of gages for a long time has been interested in trying to remove the difficulty which arose in the use of solder as a means of attachment and has made many experiments in the endeavor to find some way to dispense with it. Their investigations began more than 15 years ago and have been pursued constantly without success until the joint invention of the complainants, Mr. Reed and myself, which is the subject of this suit. The first undertaking was to find a solder of such quality that it would not fuse or soften under any temperature which steam might possess if it entered the tube-springs. All efforts in this direction failed because when the solder was brought to that degree of fluidity that it would flow sufficiently to make a good joint of the tube to the parts to which it was attached the tube would be so heated as to become annealed or softened and thus rendered
to a very large degree worthless. This was prior to 1890.
21 At this date it was thought that the tube-springs could be
attached at the ends where the attachments were required by being brazed by the application of electricity. At this time a company was doing business here in Boston in the making of machines for welding metals by electricity. The complainant company applied to it for a machine to be constructed for the brazing of the Bourdon tube-springs of the steam gage as above mentioned. It was thought it could be done and an order for the machine was given but upon trial it was found unsuccessful and had to be abandoned. The principle involved was that no heat would be transmitted by the electric welding beyond the point where the welding took place and thus the tube-spring by such a process of attachment would not be softened or annealed. Having abandoned this effort, another attempt was made on the part of one of its employees to attach the Bourdon tube-spring at its ends by means of a band or similar device of the same shape as the Bou-don tube-spring, so that these ends would make a tight joint with the respective parts to which they belonged. This proved also a failure. Meantime complaints were constantly made on the part of railroads and other users of steam gages where high pressures were employed that notwithstanding the efforts made in the protection of them from the

admission of steam into the tube-springs they were injured by the action of the heat upon the solder used in making them, and the complainant company were compelled to give further attention to the development of some device which could meet this difficulty. In 1897 one of the employees of the company again endeavored to find some way that the Bourdon tube-
springs could be attached without solder. His device was
22 a clamp so designed as to compress the tube-spring in its
ordinary form to the parts to which it was to be attached;
but after many trials it proved a failure and was abandoned. In 1898 Mr. Lane, the assistant superintendent, turned his attention to the matter and produced a device for attaching the tube-spring which was fully and carefully tried. It was on trial for many months but was unsuccessful. His device followed the process of plan of clamping the tube-spring to the parts to which it should be attached. During this later experimental work and the discovery of the unfavorable character of Mr. Lane's efforts, the question was seriously considered by Mr. Reed, the superintendent and myself. The complaints had increased as to the unreliable character of the joints made from solder and it was necessary that something should be done to meet the requirements of the advanced conditions in the use of steam under high pressures.

Adjourned at 4 p. m., to meet at the same place at 10 a. m., June 10, 1902.

BOSTON, *June* 10, 1902—10 a. m.

(Met pursuant to adjournment.)
(Counsel present as before)

Deposition of William T. Johnson.

Direct examination by RALPH W. FOSTER, Esq., of counsel for complainants:

Int. 1. What is your name, age, residence and occupation?
23 A. William T. Johnson; 40; New York city; travelling
salesman for the Crosby Steam Gage & Valve Co. of Boston, Massachusetts.

Int. 2. Where are your business headquarters? A. New York city, at the office of said company at 78 John St., New York city.

Int. 3. How long have you been in the employ of said company? A. Two years the 17th of this month.

Int. 4. Have you had any experience in placing upon the market a steam pressure gage having a Bourdon tube-spring whose ends are threaded and tapered for connection with the tubular head of the gage and with the recording mechanism of the gage? A. I have.

Int. 5. How long have you been engaged in introducing such gage to the public? A. One year and five months, that is since the first of December, 1900.

Int. 6. To what interests particularly do you introduce this pressure gage? A. Railroads.

Int. 7. With what success have you met in the introduction of this pressure gage? Please state in a general way whether or not the gage is readily accepted and also the general tenor of any comments made thereon by the roads to whose notice you have brought it? A. I have met with very good success. The gage has been readily accepted by the various railroads owing to the marked
24 improvement there is in it over the other gages. The comments that I have heard on the gage with the screwed tips from the different master mechanics is that the gage gives us less trouble and lasts much longer than a gage in which solder is used. One gentleman remarked for me to be sure and send him the gages with the screw tips, if I did not he would return them to me. Another one remarked that if the Crosby Company had gotten out a gage in which no solder was used that they had made a wonderful improvement in the gage business.

Int. 8. To what feature of the gage in question do you attribute its ready acceptance by railroads and what feature do you understand it is that commends itself particularly to the railroads? A. To the feature of screwing the tubes into the socket and also the tips into the tubes, and to the fact that there is no solder used about the gage.

Int. 9. How many railroads have been solicited by you and as a result are trying or have adopted this new gage, who were not using any Crosby gage before? A. Three.

Int. 10. Please give their names? A. Pennsylvania R. R.; Delaware, Lackawanna & Western and Lehigh Valley.

Int. 11. How many railroads have changed, if any have, from the old Crosby gage to the new Crosby gage? A. Twenty.

Int. 12. Will you name two or three of the most prominent of these roads? A. Southern R. R.; Long Island R. R.; Atlanta & West Point.

25 Int. 13. What experience prior to your employment by the Crosby Co. have you had in selling railroad supplies? A. 12 years with the Mason Regulator Co.

Int. 14. Will you state whether or not railroads readily adopt new devices or whether they are conservative in that regard? A. They do not adopt readily any new device unless you can show to them a marked improvement in the device.

Int. 15. From your experience in selling devices to railroads what success would you say had attended the sale, and introduction of the new Crosby gage whether the ordinary success or success below, the ordinary or success above the ordinary? A. The success has been far above the ordinary.

Int. 16. I will ask you once more to what feature of the Crosby gage you attribute such success? A. To the fact of the tubes and tips being screwed in place and no solder being used about them.

Int. 17. Will you kindly state the reason if you know, why railroads are conservative in making any changes in their equipment? A. From the fact that changing over such equipment costs considerable.

Cross-examination.

By John M. Coit, Esq., of counsel for the defendant:

X Int. 18. You may state that you have been selling Crosby gages having the Bourdon tube with the tapered and threaded end for the Crosby Company for one year and five months. I would like to know if you were employed by the company before
26 that time? A. I was.

X Int. 19. Were you selling pressure gages before then? A. I was.

X Int. 20. How long have you been employed by the company in selling gages? A. Two years the 17th of this month.

X Int. 21. Did you do a good business in selling such gages before you commenced to sell the screw threaded type? A. Not as much success as in the last year and five months.

X Int. 22. You have not answered the question. Question repeated. A. I did not.

X Int. 23. Do you know whether the Crosby Co. did a large business in gages before you commenced selling the screw thread type? I mean the steam pressure gages? A. I do not.

X Int. 24. Am I to understand that you did not sell many? A. Yes, sir.

X Int. 25. Did you try to sell them? A. I did.

X Int. 26. Were you instructed in December, 1900 to push the screw thread type of gage? A. I have no recollection of being particularly instructed in that direction.

X Int. 27. You did in fact recommend that form in your soliciting in preference to the other, did you not? A. I did.

X Int. 28. Do you know whether there are any other improvements in this gage which you have been selling besides the
27 screw thread connection? A. I do.

X Int. 29. Are there? A. There is.

X Int. 30. Is the gage a better finished gage than those previously put out by the company? A. It is a much better finished gage.

X Int. 31. From your experience as a salesman would you say that the business of the Crosby Co. has been increasing ever since you first went to work for them? A. I should say that it had.

X Int. 32. They are continually getting new customers for all classes of work done by them are they not? A. As far as I know, they are.

X Int. 33. Well, being a salesman you do know as far as your work is concerned, do you not? A. I know that it has increased since they got out this screw tube gage.

X Int. 34. Do you not know of the business outside of this particular gage? A. Yes.

X Int. 35. Will you please answer question 32 now definitely without limiting your answer to the screw threaded gage? A. They are.

X Int. 36. Did you sell any steam pressure gages to railroads before this screw thread type was put on the market? A. I did not.

X Int. 37. In reference to your statement that railroad companies are slow to adopt new devices because it involves cost for equipment
I would like to know what cost there would be in substituting
28 the Crosby Co.'s new gage for its old one? A. From the fact
of discarding the old gage.

X Int. 38. Am I to understand that this is the only cost? A. Another cost would be the time that it takes the man to make the change.

X Int. 39. Does a company not have to put new gages on its engines occasionally any way? A. Well, that is a hard question for me to answer as I cannot tell exactly the life of a gage.

X Int. 40. Did not some forms of pressure gages wear out or get to leaking before they had been used a great while? A. They did.

X Int. 41. Would it not be necessary, then, in a case of that kind, to buy new gages? A. Yes, or repair them.

X Int. 42. When the Crosby Co. substituted its new gages for the old ones used by railroad companies, did it take back the old gages? A. In some cases, they have made an exchange.

X Int. 43. The company allowed something on the price for this, did it not? A. They would take back the old gages and would allow the worth of brass in exchange for new ones.

X Int. 44. Did they not allow more than merely what the brass in the gage was worth? A. They allowed nothing only what the brass was worth as junk.

X Int. 45. Do you mean that they didn't allow any more in any case? A. That is what I mean, yes.

X Int. 46. Which form of gage sold at the higher price, the
29 old form or the new? A. There was no difference in the price.

Redirect examination.

By R. W. Foster, Esq.:

R. D. Int. 47. Can you say in a general way how many competitors you have who are selling steam pressure gages in your department and will you state what your department is? A. There are six competitors in my department, which is the eastern department, composed of 14 of the Middle Atlantic and Southern States.

R. D. Int. 48. Will you state, if you know, how the price of competing gages compares with the price of the new steam pressure gage of the Crosby Co., whether they are the same in price, or of a lower price, or of a higher price? A. As far as my knowledge goes, the prices of other gages are lower than the Crosby.

WILLIAM T. JOHNSON.

Deposition of Thomas R. Freeman.

Direct examination by R. W. Foster, Esq., of counsel for complainants:

Int. 1. What is your name, age, residence and occupation. A. Thomas R. Freeman; 61; Chicago, Ill. travelling salesman for the Crosby Steam Gage & Valve Co.. of Boston, Mass.

30 Int. 2. Where are your headquarters? A. 21 and 23 Lake West St., Chicago, at the office of said company in Chicago.

Int. 3. How long have you been in the employ of said company? A. Since the 12th day of Oct. 1900.

Int. 4. Have you had any experience in placing upon the market a steam pressure gage having a Bourdon tube-spring whose ends are threaded and tapered for connection with the tubular head of the gage and with the recording mechanism of the gage? A. I have.

Int. 5. What experience? A. Since the 9th of November, 1900.

Int. 6. To what interests particularly do you introduce this pressure gage? A. Railroads.

Int. 7. Any others? A. Steam ship companies, and high pressure plants.

Int. 8. With what success have you met in the introduction of this pressure gage? A. Very marked success.

Int. 9. Please state in a general way whether or not the gage is readily accepted and state also the general tenor of any comments made thereon by the railroads or other parties to whose notice you have brought it? A. The gage has been universally accepted by all superintendents of motive powers, master mechanics, general foremen and gage repairers. The opinion of all of the gentlemen that I have come in contact with is that it is the best piece of mechanism they ever saw in a gage. I have yet to receive or hear one word of complaint of the gage.

31 Int. 10. To what feature of the gage in question do you attribute its ready acceptance by railroads and others and what feature do you understand it is that commends itself particularly to said railroads and others? A. The particular feature which recommends this gage is due to the fact that there is no solder whatever used in connection with the tubes. In place of there being soldered tips and sockets it now has screwed tips and sockets, which is the commendable feature of this particular gage.

Int. 11. How many railroads have been solicited by you and as a result are trying or have adopted this new gage, who were not using any Crosby gage before? A. There have been 81 railroads that I have showed this screw tip and socket gage to. There are 6 or 7 of this 81 railroads that did not use the Crosby gage which are ow using the Crosby screw tip and socket gage.

Int. 12. Please give the names of 3 or 4 out of those 6 or 7. A.

The entire Missouri Pacific system; Chicago, Burlington & Quincy; Atchison, Topeka & Santa Fe; Canadian Pacific.

Int. 13. How many railroads out of the 81 you have named, if any, have changed from the old Crosby gage to the new Crosby gage? A. All that have been using the Crosby gage have changed to the new gage.

Int. 14. Will you name two or three of the most prominent of these roads? A. Chicago, Rock Island & Pacific; Chicago, St. Paul, Minneapolis & Omaha; Denver & Rio Grande; and Choctaw, Oklahoma & Gulf.

32 Int. 15. What experience prior to your employment by the Crosby Co. and please state when that employment began, have you had in selling railroad supplies? A. 15 or 16 years. The 12th day of October, 1900.

Int. 16. Please state for what companies you worked during any portion of that time? A. Nine years of that time I was introducing and handling the Mack injector to railroad companies for the National Tube Works Co. of Boston.

Int. 17. Please state what your occupation was prior to the 15 or 16 years about which you have testified? A. For 25 years previous to that time I was in active service as a locomotive engineer for the Chicago, Rock Island & Pacific R. R. Co.

Int. 18. Please state whether or not as such engineer you had any experience in introducing new devices in the railroad equipment and if so state in a general way what sort of experience you had without going into any particulars as to any special device? A. I have. I was consulted on several different devices by the superintendent of motive power and have made written reports to him on the advisability of using such devices as he placed on my engine for trial.

Int. 19. Will you state whether or not railroads readily adopt new devices or whether they are conservative in that regard? A. They are conservative in the extreme on the adoption of any article, whether it be little or big, high priced or cheap.

Int. 20. From your experience in railroad matter, such as you have described, what would you say as to the success attend-
33 ant upon the sale and introduction of the new Crosby gage?
Whether that success was the ordinary or below the ordinary or above the ordinary? A. Way above the ordinary.

Int. 21. Will you kindly state the reason, if you know it, why railroads are conservative in making any changes in their equipment? A. In the first place you have got to show the mechanical department of railroads that you have got a much better device than they are now using in order to get them to give you a trial, before they will consider the adoption of your device.

Int. 22. You have stated that you have sold these improved gages to parties other than railroads and have named steamship companies and high pressure plants; will you kindly define what you mean by high pressure plants, that is what business is carried on b these high pressure plants? A. High pressure plants are known a such that are carrying from 180 to 225 lbs. steam pressure, and are engaged in various occupations such as railroads, steamship companies and water works.

Int. 23. In regard to the high pressure plants other than railroads I will ask you to state briefly whether your success with such plants has been any different from your success with the railroads as you have described it? A. No, sir.

Int. 24. Generally speaking, how many competitors have you in the selling of steam pressure gages and will you please state how the prices of the gages of such competitors compare with the price of the
new Crosby steam pressure gage, whether they are of a higher
34 price, or lower price or practically of the same price? A.
They are all of a lower price. Four competitors in the railroad trade.

Int. 25. You have said, I think, that you represent the western department of the Crosby Steam Gage & Valve Co. Will you kindly state what territory that department covers and to what extent you have travelled through such territory in carrying on your particular duties as an employee of said company? A. The western department includes all the territory west and northwest of Pennsylvania; also several States of Mexico and British Columbia. I have been all over it.

Cross-examination.

By John M. Coit, of counsel for defendant:

X Int. 26. Were you employed in selling pressure gages prior to Oct. 12, 1900? A. No, sir.

X Int. 27. Am I to understand you sold no gages for any other company? A. No, sir, I did not.

X Int. 28. Did you try to sell any other kind of gage to the railroads than the one having the screw threaded tube? A. No, sir; the first gage I handled was the screw threaded gage.

X Int. 29. Am I to understand that you never handled the old form of gage at all? A. I never did.

X Int. 30. If you never had any experience in selling other forms of gages what do you mean by the statement that your success with
the screw threaded type was above the ordinary? A. Well
35 above the ordinary by the way the railroads had taken hold
of it, as compared with other devices that I am handling.

X Int. 31. Is the steam pressure gage which you have handled a better looking gage than the old form made by the Crosby Co.? A. From a point of mechanical construction, yes.

X Int. 32. Has it a better finish and better material in it? A. All working parts are much better.

X Int. 33. Do you know whether it embodies any improvement besides the screw thread connection for the pipes? A. Yes.

X Int. 34. Does it embody any other improvements? A. It does.

X Int. 35. If you got any new customers for the company it would be for the new form of steam pressure gage, would it not? A. It would.

X Int. 36. In substituting the new gages for those before in use, did you ever make any allowance to the purchasing company for the old gages? A. The company does allow them for the old gages what they are worth for junk.

X Int. 37. Is this true of the old gages which are not made by the Crosby Co.? A. Yes, sir.

Redirect examination.

By R. W. FOSTER, Esq., of counsel for complainants:

R. D. Int. 38. If you know, will you state whether it is customary
or not among sellers of steam gages to take and allow for old
36 gages when selling new ones to take the place of the old
ones? A. It is customary practice to allow for old gages in
part payment for new ones by all companies, as I understand it.

THOMAS R. FREEMAN.

JOSHUA H. MILLETT.

Direct examination continued:

A. In Feb'y, 1899 I suggested to Mr. Reed that we take a piece of
the ordinary brass tube or pipe of suitable diameter and length, cut
screw threads on each end between these ends turn down the tube
so that its walls should be of a proper thickness, flatten and bend it
in the turned portion to the form of the Bourdon tube-spring re-
quired in making the locomotive steam pressure gage. There was
considerable discussion between us as to the method of attaching the
tube so made with its screwed ends to the socket of the gage, which
is that portion of the gage by means of which it is attached to the
steam pipe of the boiler, and to the tip or plug to which the register-
ing mechanism of the gage is connected, so that there would be
tight joints and at the same time be unaffected by the temperature
of the steam or of any heat which might come to them, said joints
being made without the intervention of solder. Mr. Reed suggested
that these screw threaded portions might be made taper in form so
that where the attachment was made the parts would unite firmly
and tightly. Knowing the importance of the location of the
37 tube spring when it was introduced into the gage case, I ques-
tioned whether this could be successfully done and expressed
the opinion that it might be better to have the threaded portion
straight and when the spring was screwed into place the threaded
union could be made tight by a binding or jam-nut, having a packing
of some kind interposed between the latter and the socket or tip to
which it was attached. After much discussion I acquiesced in the
judgment of Mr. Reed as to taper threaded ends and requested that

he make a tube-spring following the suggestions which we had considered for examination and trial. The next morning, on my visit to the factory, where all this conversation had taken place, Mr. Reed showed me a tube-spring made as I requested. After an examination of it it was attached to a steam boiler in which there was steam under a pressure of 200 lbs. per square inch as my recollection is and the steam was allowed to enter directly into the tube-spring. It was found to be tight and to remain tight. This experiment continued for some time in order to give it a fair trial. The joints did not leak nor were they affected in any degree by the temperature of this high pressure steam. Thereafter, as soon as proper provisions could be made in the way of tools and machines for making a gage, having this tube-spring the company entered upon its production and has continued ever since. The problem was solved. The tube spring which was furnished by Mr. Reed as above stated was like the model tube-spring which I now have, except that it was firmly screwed together in all its parts for service. The model has all the joints loose.

(Complainants' counsel offers in evidence the model tube spring
of Millett and Reed and the same is marked "Complainants'
38 Exhibit No. 1 Millett & Reed Tube-spring C. M. R., Spec.
Ex.")

Int. 11. State whether or not you and Mr. Reed applied for letters patent of the United States for said improvement in Bourdon tube-springs made by you and if so state whether or not said improvement and said application are the foundation of this suit? A. We did; they are.

Int. 12. State whether or not before June 12, 1899 you and Mr. Reed were the original first and joint inventors of the improvement in Bourdon tube-springs employed in steam pressure gages and just described by you not known or used by others before your invention or discovery thereof and not patented or described in any printed publication in any country before your invention or discovery thereof or more than two years prior to your application for a patent therefor and not in public use or on sale for more than two years prior to your application for a patent therefor and not abandoned and whether or not any application for a patent on said improvement was before said June 12, 1899 filed by you or your representatives or assigns in any country foreign to the United States. A. We were. There was not.

Int. 13. State whether or not you have taken any particular steps to ascertain to what extent this new spring-tube of yours has gone into use and as to the reception, whether favorable or otherwise, it has met from those to whom it has been shown? And in answering this question, please state a little more fully than heretofore how
many places of business you have in this country and how this coun-
try is divided by you in reference to carrying on your busi-
9 ness and how your business in these different centres is
managed? A. There are three departments into which the

country is divided for doing business, namely: The New England department comprising the New England States and Canada; the store representing which is located in Boston and is under the management of an experienced person; the eastern department, having its store in New York city and under the management of an experienced person. This department comprises the Atlantic and Southern or Gulf States. The western department the store of which is at Chicago, Ill., and under the management of an experienced person. This department embraces all of the country west of New York, Pennsylvania and north of the Gulf States. Each manager has the control and administration of the business in his department, employing salesmen and regulating their movements, all done in the name of the company. To ascertain what has been done in the sale of steam gages having the screwed tube-spring, I have obtained reports from these managers as to what they have done in regard to them.

Int. 14. In view of the investigation made by you as to which you have just testified, state if you can, whether or not there has been any demand for your improved gage having the screw threaded tube-springs and if so what demand there has been and is now and to what features of the said gage such demand, if any, is to be attributed? A. The managers of the eastern and western departments have reported an increasing demand in the use of steam gages having the screw threaded tube-spring. This growth in the business is attributed by them to the particular improvement of these tube-springs as being screw threaded in their attachments. The business has not been confined to their sales to railroads but has developed among manufacturers some of whom have heretofore used the Crosby gage; others who were not customers of the company have given orders for the gage having screw threaded tube-springs because they were so made, particularly has this been the case among agricultural implement makers where the usage of steam gages is very severe and difficulties and troubles arise from the use of the ordinary steam gage using solder for attachment of the tube-springs. Report has come to me that many railroads, who were not using the Crosby gage have adopted it and are now using it as their standard gage since we have been able to provide them with a screw threaded tube-spring. Indeed, these reports have been corroborated by the increased production of this class of gages at the factory over that of a similar class prior to the adoption of this style of gage.

(Reports referred to by witness were shown to and examined by counsel for the Commissioner of Patents.)

Int. 15. Whether or not any particular effort, so far as you know, has been made by your company to introduce this new gage having the threaded tube-spring? A. Not to my knowledge. Each manager is directed to require his salesmen to sell all the production of the company, and to make efforts to introduce goods where they are wanted. If a salesman visits a railway, his business is to present all the productions of the company which are designed for use on a railway, making no greater effort to sell one more than another as the company's desire is to sell all of them in the largest quantity.

41 Int. 16. How many companies compete with you in the sale of steam pressure gages in the United States? A. There are eight or ten.

Int. 17. Had you before your described invention ever known of a brass Bourdon tube-spring having a threaded end either tapered or untapered? A. I had not.

Int. 18. Had you before your described invention ever known of a steel Bourdon tube-spring being employed in a steam pressure gage or of such use since your invention? A. I had not and I have not.

Int. 19. Does your company make steel Bourdon tube springs and if so what are the features of such springs and for what purpose are such springs used? A. They do. They are used in the making of hydraulic gages where the pressures are very high being from 1,000 to 20,000 lbs. per square inch. They are made of steel in order to measure this tremendous load. They have thick walls and the ends have straight screw threads, one to screw into the socket of the gage and the other to screw into the cap or tip to which is attached the registering mechanism. The screw threaded portions fit comparatively loosely to enable the tube-spring when it is attached to the socket to be brought into the plane parallel to the dial of the gage. When so located it is fixed in position by the application of solder which flows in and around all of the threads of the parts filling completely every interstice and thus forming a tight union or joint; besides which the solder is banked up about the outer part of the socket or tip as a re-enforcement of the union. What has been
42 said in relation to the union of the tube spring and the socket applies equally to the union of the tube-spring and the tip. All hydraulic gages have been so made since the company was organized down to the present time and the company knows no other way to make them. So far as my knowledge extends all hydraulic gages of other makers are so made, as I have seen very many of them at our factory for repairs.

What I have said is illustrated by the two models which I hold in my hands. One of them represents the tube as it appears before it is flattened or bent and the other shows the tube-spring properly made and formed and attached to the socket and tip. It is cut away to show in cross-section the union of the tube-spring and these parts, plainly showing the solder which fills in between the threads and re-enforces the joints.

I spoke of gages of other makers and I offer a steel tube-spring which I have had taken from an hydraulic gage made by another gage maker which was sent to us for repairs and which shows the straight threads on the ends of the tube and the method of soldering the parts that are joined.

(Complainants' counsel offers in evidence a steel tube having straight threaded ends and the same is marked "Complainants' Exhibit No. 2 steel tube with straight threaded ends, C. M. R. spec. ex.")

(Complainants' counsel offers in evidence a steel Bourdon tube for a hydraulic gage showing in section its union with the socket of the gage and with the tip and the same is marked "Complainants' Exhibit No. 3, steel Bourdon tube-spring for a hydraulic gage, C. M. R. spec. ex.")

(These Exhibits No. 2 and No. 3 are those just referred to by the witness, Mr. Millett.)

43 Int. 20. Please state briefly what is the character of the fluid employed in hydraulic gages and what effect, if any, such fluid has upon the solder employed in the joints of said tube with said gage and tip? A. The fluid is water and it has no effect upon the solder when in contact with it.

Int. 21. Will you examine the tube-spring I now hand you and say what sort of a spring it is and describe its features and anything you may know concerning its history? A. The tube-spring handed to me was taken at my request from a locomotive steam gage sent to our factory to be made over. It is of the ordinary Bourdon tube type being made after the manner of what is called solid drawn, that there are no seams or union in the tube itself. It is attached to the socket and the tips by solder in the old and usual way.

(Complainants' counsel offers in evidence the Bourdon tube spring just described by the witness and the same is marked "Complainants' Exhibit No. 4, Ashcroft tube-spring, C. M. R., spec. ex.")

Int. 22. Will you please examine the tube-spring I now hand you and describe it and relate its history? A. The tube-spring which is handed to me was taken at my request from a locomotive steam gage sent to our factory to be made over. It is of the ordinary Bourdon tube type with the exception that it has corrugations upon its sides. It is attached to the socket and tip in the ordinary way by the use of solder as may be seen by the portion cut out.

44 (Complainants' counsel offers in evidence the tube spring just described by the witness and the same is marked "Complainants' Exhibit No. 5, Star tube-spring, C. M. R. spec. ex.")

Int. 23. Will you please examine the tube-spring I now hand you and describe it and relate its history? A. At my request the tube-spring handed to me was taken from a locomotive steam gage sent to our factory to be made over. It is of the ordinary Bourdon tube type and is attached to the socket and tip by solder in the ordinary way. This style of tube spring, and the two other described in the last two answers, represent the tube-springs which the respective makers of them now employ in the manufacture of locomotive steam gages today.

(Complainants' counsel offers in evidence the tube spring just described by the witness and the same is marked "Complainants' Exhibit No. 6, American tube-spring C. M. R., spec. ex.")

(Complainants' counsel offers in evidence a steel Bourdon tube-spring, being the same mentioned by the witness in his answer, to Int. 19 and the same is marked "Complainants' Exhibit No. 7, steel tube-spring repair gage, C. M. R., spec. ex.")

Cross-examination.

By John M. Coit, Esq., of counsel for defendant:

X Int. 24. Does your company do a very large business in pressure gages? A. Comparatively so.

X Int. 25. Isn't it one of the largest in the country? A. In the manufacture of high grade gages, it is.

X Int. 26. Do you advertise your business and any new forms of devices that your company gets up? A. We do advertise all of our productions very extensively.

X Int. 27. Did you do this in regard to the screw threaded Bourdon tube gage? A. Only in the publication of what is called the railway catalogue which embraces all of our productions for railway purposes. In periodicals it was advertised the same as other instruments.

X Int. 28. Does not your company regard this gage as possessing especial merit and therefore make a specialty of it in your manufacture and advertising? A. We do regard it as having especial merit but I cannot say that it has been specially published more than other productions which are meritorious. Of course, salesmen are instructed to call attention to any special improvements in order to obtain business and doubtless in advertising the attention of the public at times may specially be called to a new feature which is esteemed by the company to be meritorious.

X Int. 29. Do you now manufacture this new form exclusively? A. We do not but it is our purpose to adapt it to every form of gage using the brass Bourdon tube-springs of sufficient size to permit its use.

X Int. 30. Am I to understand that you now make comparatively few of the old form of gage? A. The old form of gage today is confined to what is called the single spring type, that is a gage having but one tube-spring instead of two tube-springs, as the exhibits show.

Adjourned until 10 a. m. Wednesday, June 11, 1902.

46 BOSTON, *June* 11, 1902.

(Met pursuant to adjournment.)
(Counsel present as before.)

Cross-examination of Mr. MILLETT continued :

X Int. 31. Is it your purpose to discontinue the manufacture of the old form of gage and have your efforts since perfecting the new form been directed to that end? A. It is as fast as the preparations can be made in the way of machines and tools for doing it, it is now being done.

X Int. 32. Isn't your business in other devices continually spreading that is, do your salesmen not get new customers for those devices? A. It is; they do.

X Int. 33. Did you in fact sell the old form of gage to railroad companies up to the time that the screw threaded form was made? A. We did.

X Int. 34. Do you charge more for the new or the old form? A. We charge the same price. I wish to add that on account of the great competition in gages, the prices to railroads and those users of double spring gages had been greatly reduced at the time of the production of the screw threaded gage. Our company declined to make any reduction in the price of the old or the new gage and went into the business of selling more or less handicapped by demanding a higher price than our competitors. The screw threaded gage is a double spring gage.

X Int. 35. Which costs the most to make? A. At the present time there is little or no difference in their cost.

47 X Int. 36. Which form includes the better material and is the better finished? A. There is no difference in the manufacture of the gages in material or workmanship excepting so far as appears in the difference in the tube-springs.

X Int. 37. Does your present gage involve any improvements over that which you are placing on the market before the screw threaded type was gotten out aside from the screw threaded feature? A. Not for use as a steam gage. Any modification which may appear has been made in the interest of manufacturing as to method and cost. I recall no other advantage, or improvement.

X Int. 38. Which form of gage has the most attractive appearance? A. Seen externally, as all gages are seen as used, there is no difference in their appearance. Whatever modification or improvement which has been spoken of is of the internal construction, which is wholly out of sight as a steam gage when completed for use.

X Int. 39. How is it when the interior construction is examined? A. Then as between the old and new type the difference will appear as a difference between the tube-springs. This difference is in favor of making the last type the more attractive.

X Int. 40. You state that it is common to use steam pressure of

225 lbs. to the square inch; about when did the use of this high
pressure commence? A. I cannot speak positively of any
48 particular date when the use of such a pressure began but
I am quite certain that it was more than five years ago.

X Int. 41. About when did you get complaints of the solder in the gages melting on account of the high pressure and heat? A. More than 15 years ago. I say that because the first experiments I recollect were made when we built our factory which was about that time.

X Int. 42. You state that the experiments then were unsuccessful; do you mean tbat you could not make a gage without the use of solder which would stand the pressure or merely that you could not make such a gage economically so as to make it pay? A. At that time the only way a gage was made was by attaching the tube-spring by means of solder and the experiments then were conducted along that line. The purpose of the experiments was to find some solder which might be used in attaching the tube-springs which would not fuse or soften at any temperature of steam which might enter the gage in use.

X Int. 43. You did not, then, try to make a gage without solder? A. We did not.

X Int. 44. What is the name of the company that furnished you a machine for brazing mentioned by you in your answer to Int. 10? A. I do not recall the name more than it was an electric welding company. It did not continue in business and I have wholly lost sight of it. It had an office at that time on Kilby St. in this city and a place of business for showing its work in the factory of
Thomson-Houston Co. at Lynn, Mass., where I saw what it
49 could do in the way of brazing metal by the application of
electricity.

X Int. 45. What do you mean by the statement that "no heat would be transmitted by the electric welding beyond the point where the welding took place and thus the tube-spring by such a process of attachment would not be softened or annealed"? A. The claim of the welding company was that when they welded the ends of two pieces of metal, the only heat generated was at the union of the two pieces upon the application of electricity which was not transmitted but a short distance. My recollection is that it was said at the time about half an inch from the ends. These pieces which were welded together were held in clamps in such a way that they were kept cool as the claim was. I saw at Lynn pieces of iron more than an inch in diameter instantaneously welded together and the heat appeared to be directly at the union and nowhere else. It was on account of this claim and demonstration that we believed that this method could be applied in the uniting of the socket and tips to the Bourdon tube without affecting the temper of the tube.

X Int. 46. Did you try this machine on Bourdon tube gages? A. We did not as we were unable to procure the machine after it was ordered from the welding company owing to the fact that they suspended active business. It was a great disappointment to us notwithstanding the fact that it would cost us more than $1,000. to get it.

X Int. 47. Do you believe that such a machine would have made a gage which would satisfactorily stand the high pressure? A. I don't know now, but we thought so then.

X Int. 48. Do you not use in your factory brazed tubes
50 for these steam pressure gages and have you not used them
for many years? A. We do and we have.

X Int. 49. Will you please describe a little more specifically the band or similar device which you say was tried by one of your employees to make a joint in these gages? A. This band was of the form of the Bourdon tube to be attached to the socket. The socket had a projection made to fit the interior of the Bourdon tube. The band was placed outside of the Bourdon tube and when the latter was forced over the projection of the socket this band was driven down so that when in place it surrounded the tube and the projection within it where it was compressed in a form by means of a power press to unite as closely as possible the several surfaces in contact.

X Int. 50. About when was this band tried? A. Between 1890 and 1897, I cannot give the year.

X Int. 51. Did you get any of the gages made in this way to stand the high steam pressure? A. We did not.

X Int. 52. They would stand the lower pressures, would they not? A. If all the parts were carefully made so there was a smooth union of the surfaces in contact, they probably would not leak with low pressure.

X Int. 53. What was the clamp which you say was made by an employee in 1897? A. It was similar in form to the band above mentioned and in order to make a tight joint between the surfaces of the gage tube and the inner projection of the socket, there was
interposed some packing material. Then the whole construc-
51 tion was forced together in a power press to give a binding
effect to the whole.

X Int. 54. Did this prove any better than the band previously used? A. It did, due in our opinion to the interposition of an elastic material which would permit a closer contact of the meeting surfaces.

X Int. 55. Did you ever try to attach the tube by a union joint? A. Not to my knowledge.

X Int. 56. What was it in 1899 that suggested to you the idea of taking the ordinary brass tube, cutting screw threads upon its ends turning down the centre part, flattening the centre and bending it to form the Bourdon tube? A. The best device which had been made prior to that time for attaching the Bourdon tube to the socket was called Lane's device. It was the adaptation of the flat Bourdon tube of commerce and his endeavor was to attach it to the socket and tips as then substantially made. After considerable trial of the

gage he made it proved a failure and was removed from the boiler on which it was tested in the summer of 1898. At this time, on account of a change in the superintendency of the business of the company, Mr. Lane acted as superintendent and all efforts in the way of improvement of the Bourdon tube attachments were suspended. It so continued until the autumn or early winter following when our salesmen reported many difficulties and troubles arising from the destruction of gages made in the ordinary way of attaching the Bourdon tube with solder. It became very acute and the attention of myself and Mr. Reed who was the new superintendent and Mr. Lane was anxiously turned to find some way to overcome the
52 trouble which we were having for it seemed to us that unless something was done our railway business and all other business where the use of the high pressure steam gages was involved would be materially affected or lost. We had many conferences and at this time I made the suggestion without anything in view, and without any reflection and I can only say I made it.

X Int. 57. At the time that you conceived this idea, did you know of any Bourdon tube having thickened screw threaded ends and thin flattened middle portions? A. Yes, the Bourdon tube made of steel such as was used in the hydraulic gage.

X Int. 58. Had you used those tubes long in your factory? A. Ever since the company was organized in 1875, in the same way and just as we do now.

X Int. 59. When Reed suggested tapering the screw thread, was that the first time that you had ever heard of tapered threads to make a steam tight joint? A. No.

X Int. 60. You knew, then, that such threads would make a steam tight joint? A. Yes.

X Int. 61. Had your company been using tapered screw threads on articles manufactured by it for use in connection with steam boilers so that a steam tight joint would be secured? A. We had.

X Int. 62. How long have you used such threads? A. Ever since the company has been in business.

X Int. 63. Do you use solder in those devices? to make the joints steam tight. A. Probably not.

53 X Int. 64. As I understand your answer to Int. 10 your only doubt of the practicability of the tapered joints suggested by Reed was whether the threads could be so accurately cut that the curved tube would be in a plane parallel to the face of the gage when it was screwed in as far as it would go; is this understanding correct? A. Substantially.

X Int. 65. Did you know that this same question had arisen in regard to other devices such as gage cocks and even as to the sockets of pressure gages? A. I did.

X Int. 66. Did you know that steam fitters sometimes in applying a device of this general class to a boiler cut the threads more or less to make the device face in the right direction when screwed tight? A. I did not.

X Int. 67. Wouldn't this occur to you if you attempted to apply a device of this kind and found that it did not face in the right direction? A. It might.

X Int. 68. In your opinion would the straight screw thread and the jam nut mentioned by you in answer to Int. 10 make a steam tight joint? A. I thought it would and I still believe it would.

X Int. 69. The steam tight joint in that case would be due to the jam nut and not to the thread, would it not? A. To the jam nut and the packing.

X Int. 70. Did you ever try that form? A. I did not.

X Int. 71. When you conceived the idea of the screw threaded joint did it occur to you that there were difficulties in making
54 it practically to be overcome? A. It did not because as soon as the suggestion was made Mr. Reed added other suggestions and statements as to the practical application which over-bore any thoughts I had on the matter, if I had any.

X Int. 72. Didn't the question arise as to whether it could be made economically so as to pay as a commercial enterprise? A. Not at that time. The question of the economy of the making of the device was not considered at all, the burning question being whether we could make any device at all which could be substituted for the old Bourdon tube-spring attached with solder.

X Int. 73. You did consider that question at some time, however, did you not? A. When the practicability of the device was determined then the question of economy arose in its adaptation to our business in the making of steam gages.

X Int. 74. From a practical business standpoint, was it not as essential to be able to make them economically as was the form of the device? A. It was unless the device should be so much superior to the old device as to enable the company to get more for it.

X Int. 75. Did it not involve considerable expense to your company to devise means for making this new form of gage commercially? A. Considerable, is a relative term and to me I do not think that the expense of preparing to make the new gage is more than we are compelled to incur in the development of any new thing.

X Int. 76. Didn't you have to put in new machinery and
55 in fact devise some of that machinery? A. We did.

X Int. 77. About when was that machinery so far completed that you were satisfied that you could make the gages economically? A. At first these gages were made with the tools and machines which we had on hand which could be adapted to the purpose and new ones were only added that we thought might improve upon the methods which were first employed. This is not an exceptional instance as the policy of the company is in all its departments to change its machinery and tools whenever it can see any economy in doing so in making its productions better or cheaper. It is a common occurrence.

X Int. 78. Are the hydraulic gages using the steel tube which has been described by you made in the same part of your factory as the steam gages? A. They are.

X Int. 79. Are they made by the same workmen? A. I presume so.

X Int. 80. Are not many of the parts or castings made to be applied to either the steam or hydraulic gage as desired? A. Not wholly. The pressures required to be registered by a hydraulic gage are so great that they require specially heavy fittings.

X Int. 81. They work on the same principle and are made in the same way except as to strength and protection against heat, are they not? A. Substantially.

56 X Int. 82. Why did you not, when you first commenced to use the steel tube springs in hydraulic gages, make the screw thread tapering so as to avoid the necessity of solder? A. I don't know.

X Int. 83. Aren't most screw threads on steam pipes tapering? A. I understand so.

Redirect examination.

By R. W. Foster, Esq., of counsel for complainants:

R. D. Int. 83. Johnson and Freeman, the salesmen of your company, have testified that they entered your employment in the fall of 1900 and that they gave their attention to the sale of the improved gage and had had no experience in selling the old gage. Will you state whether or not you have any salesmen now in your employ or have had in your employ any salesmen who have sold both the old gage and the new gage? A. No.

R. D. Int. 84. Will you briefly state what change, if any, took place at or about the time mentioned, namely the fall of 1900, in the matter of your salesmen who gave their attention to the sale of steam pressure gages to railroads? A. In the spring of 1900 the salesman who had had long experience in the railroad work, travelling over the whole country, resigned and from that time down to the employment of Messrs. Johnson and Freeman there was no salesman representing the company. At the the time of the employment of the latter the railway business of the company was divided between the different departments thus permitting each manager to select his salesmen for his particular territory.

R. D. Int. 85. Do I understand that the salesman who you
57 say resigned in the spring of 1900 had no experience in selling the new gage? A. No, possibly he may have known of it, and presented it in one or two cases.

R. D. Int. 86. I intended to ask you whether from your experience in the manufacture and sale of railroad appliances you are able to form an opinion as to whether railroads are conservative or otherwise in adopting new appliances and if so what that opinion is? A. The only information which I have as to the subject matter of the question is derived from the reports which come to me from persons engaged by the company in the due course of business. From such information, it is my opinion that it is very difficult to introduce to railroads any new or unusual device to supplant one already in use. This especially is so since the combination of so many railroads into one large operating concern. Many railroads establish what they are pleased to call standards of things used and until these standards can be overturned, however poor they may be, it is difficult to get a hearing before the mechanical department and most certainly before the purchasing department.

R. D. Int. 87. Have you read the opinion of the court in the case of Millett & Reed *vs.* Duell, Commissioner of Patents decided May 21, 1901, as it is printed in the Official Gazette of Aug. 6, 1901? A. I have.

R. D. Int. 88. I notice in said opinion the following language: "If there was in fact a soldering in the device mentioned or shown in the Lane patent, and such soldering rendered that device essentially different from the invention of the appellants, it ought not to
58 have been difficult to adduce some evidence of the fact." I
will ask you whether or not you made any attempt to introduce evidence relative to the matter in question at any time during the proceedings leading up to said suit in which said opinion is given and if so what that attempt was? A. When I was informed that the Patent Office had cited the Lane patent against the application of Mr. Reed and myself upon the ground that the drawings of the Lane patent showed a similar construction as to the tapered screw threaded portion of the tube-spring, I communicated with our solicitor and requested him to have testimony, if possible, introduced to show that the Lane device so far as the attachment of the Bourdon tube spring was concerned had a straight screw threaded and attached to the socket thereby and with the interstices or parts filled with solder in the ordinary way hydraulic gages were then and now made, that Mr. Lane was an employee of our company and that the draftsman who made the drawing was also an employee under him and that in making the drawing he had followed the hydraulic gage which we were then making and that it was to such a gage having such a tube-spring so screw threaded and attached with solder that the Lane patent referred in this sentence "the socket B * * * within the gage has a thread *b′* to which the usual tube-spring C is secured." (Page 1, lines 44, 49 of the specification of the Lane patent.) A. He replied that under the practice of the Patent Office it was impossible to introduce the testimony which I had desired to be put in to show what the drawings of the Lane patent were, and I understood that no such testimony was introduced.

59 R. D. Int. 89. In reply to X Int. 31 you say that it is the purpose of your company to discontinue the manufacture of the old form of gage and that you have been making efforts to that end since perfecting the new form as fast as preparations can be made in the way of machines and tools for doing it. Will you please

state why you are giving your attention so particularly to the new gage and giving up to some extent the old gage? A. On account of the good success with which the newer type of gage has been received by the public and the increasing demand for it which has confirmed our own judgment that it is a very meritorious device and is worth our while to not only continue but increase its manufacture.

Recross-examination.

By JOHN M. COIT, Esq., of counsel for defendant:

R. X Int. 90. You state that your salesman who resigned in the spring of 1900 had no experience in selling the new gage. Do you mean by this that the gage was not put on the market until that time. A. I do not.

R. X Int. 91. If it was put on the market before then, how is it that your salesman had no experience with it? A. This salesman was not travelling during the summer and early autumn of 1899 for the company. Late in the autumn it was the purpose of the company to send him to the Pacific coast, in relation to sales of many of its products but by some misunderstanding and difficulties which arose during the fall and winter, he did but little. Out of these troubles his resignation came so that for several months in the winter time he did but little in the representation of the company.

60 R. X Int. 92. Am I to understand then that your company had put the devices on the market but had not furnished them to this salesman? A. They had and perhaps this salesman had introduced them but to what extent certainly I have no recollection or knowledge. The selling department has immediate charge of the salesmen and what it may or may not have done in the ordinary course of the business of selling I cannot recall and unless there was something unusual its action might not be brought to my attention. My recollection now as to this salesmen and what was done in part is due to the difficulties which existed with him.

JOSHUA H. MILLETT.

Deposition of Samuel G. Reed.

Direct examination by R. W. FOSTER, Esq., of counsel for complainants:

Int. 1. Please state your name, age, residence and occupation, and whether you are one of the complainants in this suit. A. Samuel G. Reed; 30 years; Rockland, Mass.; superintendent of the Crosby Steam Gage & Valve Co., Boston, I am.

Int. 2. What experience and training have you had as a mechanical expert or mechanical engineer? A. I received a technical education at the Massachusetts Institute of Technology, graduating in the department of mechanical engineering and being employed in

the engineering laboratories after graduation for a period of
61 almost two years as instructor. My practical experience has been obtained in the shops of the Lamson Machine Co. of Abington, Rollins Engine Co. of Nashua, N. H., the Atlantic Works of East Boston and the Crosby Steam Gage and Valve Co. In all covering a period of about 12 years.

Int. 3. Have you testified as an expert in any patent litigation and if so, will you please state the subject matter of the litigation, that is, state the nature of the device, or devices involved therein? A. I have; the subject matter was concerning various devices for muffler attachments to safety valves for locomotives.

Int. 4. Of what scientific bodies, if any, are you a member? A. American Society of Mechanical Engineers.

Int. 5. Please state how long you have been connected with the Crosby Steam Gage & Valve Co. and state briefly what your duties have been from the start and what your duties are now. A. Since December, 1895. From that time until August, 1898, I was employed as mechanical engineer having work particularly connected with the New England sales department. In August, 1898, I was appointed superintendent of the Crosby Company which position I have held since that time. My duties comprise the care and maintenance of the property, the designing and construction of the goods and the inspection and shipping of the products.

Int. 6. What is a steam pressure gage; for what purpose is it used and to what extent, if any, is said company engaged in the manufacture of steam pressure gages? Please describe fully a
62 steam pressure gage and all its parts and state how it is attached to a boiler. In answering this question, please use as a model the gage I hand you and say first by whom that gage was made and whether or not it is taken out of stock? A. The sample gage I have is one made by the Crosby Steam Gage & Valve Co. and is a regular gage such as is used in filling any order from a customer with the exception that the dial here is cut away to show the working mechanism. The parts of this gage were taken from our stock of regular parts and assembled in the regular way. The manufacture of steam pressure gages is one of the principal departments of the Crosby Company's business. Steam pressure gages are instruments universally used to show the pressure in steam boilers, pipes or other receptacles and consist ordinarily of the following features; the principal part of the gage is the tube-spring which is connected at one end to a socket or tubular head which forms the point of connection to the boiler. The other end of the spring is attached to the mechanism by which the movement of the spring is transmitted to a hand or pointer which moving about an axis indicates the pressure inside the boiler. The tube-spring is of a flattened section made from brass and curved into some portion of an arc of a circle. The pressure of the steam inside this tube tending to make the section nearer round causes the free end or end connected to the mechanism to move and it is this movement that is

utilized to indicate the pressure in the boiler. In this particular gage we have what is known as a double tube gage in which the movement of two springs is utilized to act in conjunction and move
the index. The springs are connected to the same socket and
63 in this case are both made from the same piece of tube. The
steam gage is attached by a gage cock and siphon to a steam pipe directly to the boiler. It is generally placed in an upright position.

Int. 7. What is the meaning of the term siphon just employed by you and is it shown in the model you are using? A. The siphon is not a part of the steam gage but of the pipe connection from the boiler and is placed between the boiler and the gage to protect the gage so far as possible from the steam. It consists generally of one or more coils of pipe or a loop in which the steam can condense before reaching the gage tube.

Int. 7. Will you examine the piece of flat tubing which I now hand you and say whether or not the tube-spring you have just described is formed from a piece of flat tubing similar to this and if so state how it is made therefrom? A. It is. A straight piece of tube such as I now have is filled with sand and plugged with a piece of wood at each end. It is then rolled on a machine into a form approximating two semi-circles such as is shown by the tube I now hold. The plugs are withdrawn, the sand knocked out and the tube is fitted to the socket and tips which are soldered in place and the tube as completed is shown by the model I now hold.

(Complainants' counsel offers in evidence the steam pressure gage just described by the witness and the same is marked "Complainants' Exhibit No. 8, model steam pressure gage, soldered tube-springs C. M. R. spec. ex.")

(Complainants' counsel offers in evidence a piece of flat
64 brass tubing and the same is marked Complainants' Exhibit
No. 9, model flat tubing for tube-spring, C. M. R., spec. ex.")

Int. 8. Please examine the model I now hand you and say what it is? A. This is the piece of spring tubing I have just described as showing the same bent into shape for use.

(Complainants' counsel offers in evidence the tubing just described by the witness and the same is marked "Complainants' Exhibit No. 10, model flat tubing bent into shape, C. M. R., spec. ex.")

Int. 9. Please examine the model I now had you and say what it is? A. This represents the tip or plug finished and tinned ready to press into the end of the tube and be soldered into place.

(Complainants' counsel offers in evidence the model just described by the witness and the same is marked "Complainants' Exhibit No. 11, model tube-spring tip, C. M. R., spec. ex.")

Int. 10. Please examine the model I now hand you and say what it is? A. This piece is the socket which surrounds the tube-spring and serves to hold the same into the gage case and is used to connect the whole to the steam pipe from the boiler by means of the screw thread.

(Complainants' counsel offers in evidence the model just described by the witness and the same is marked "Complainants' Exhibit No. 12 model socket soldered tube-spring, C. M. R., spec. ex.")

Int. 11. Please examine the model I now hand you and say
65 what it is? A. This model represents a completed gage
tube-spring with soldered tips and sockets, the soldered joints having been cut away to show the method of making the joints.

(Complainants' counsel offers in evidence the model just described by the witness and the same is marked "Complainants' Exhibit No. 13, model tube-spring socket and tips soldered tube-spring, C. M. R., spec. ex.")

Int. 12. Will you please examine the model I now hand you and say what it is and describe its use in connecting a steam pressure gage to a boiler? A. This is commonly known as a union gage cock. It consists of a combination of a plug cock and a union connection. The cock is employed with all gages in order that whenever the gage is to be removed from the piping the steam may be readily shut off. The union joint serves as a ready means of removing the gage and also will allow the gage to be adjusted and to face in any direction. The union joint consists of the two ends of the metal pipe brought together to form a steam tight joint and these are held in place by a nut which is carried by one piece and screws to a threaded projection on the other.

Int. 13. Was it a Bourdon tube-spring and how extensively is it used in steam pressure gages; of what metal is it made when so used? A. I have described the action of the Bourdon spring in my answer to Int. 6. It is used in almost all steam pressure gages and is always made of brass.

Int. 14. Prior to the spring of 1899, what was the method
66 or methods in common use in joining the Bourdon tube spring
to the tubular head or socket of the steam gage and to the registering mechanism of the steam gage? A. It was always by solder as shown in the spring in "Exhibit No. 8, model spring pressure gage, soldered tube-springs."

Int. 15. What are the advantages and the disadvantages of the use of solder as you have described it, first when the steam pressure gages are to be used with boilers under low steam pressure, and second when the steam pressure gages are to be used with boilers under high steam pressures and in giving your answer please state what in this connection is low steam pressure and what high steam pressure? A. The use of solder in low pressure steam gages (and by low pressures I mean not over 125 lbs. to the square inch) makes the joint tight and the heat of the steam is not sufficient to cause any great trouble by fusing the solder but in gages used on high pressure steam (the pressure in this case being from 180 to 250 lbs. per sq. inch) the heat, if allowed to come in contact with the soldered joint, fuses the solder almost immediately and destroys the gage.

Int. 16. Will you briefly describe the danger of heat coming into contact with the soldered portions of a steam pressure gage and whether it is possible to obviate this danger by any devices employed for that purpose? A. It is not possible to overcome this danger because the heat may be transmitted by adjacent portions of the boiler and the effect on the soldered joint will be the same as though the hot steam itself had come into contact with it. This is generally the case on boilers carrying the high pressure I have just spoken of.

67 Int. 17. Whether or not you made any experiments with a view to overcoming the difficulties you have just named arising in the use of solder in connection with high pressures and if so state when with whom if anybody and what those experiments were. To illustrate your answer you may use the exhibits which I will now offer in evidence.

(Complainants' counsel offers in evidence two similar pieces of brass tubing having their ends taper threaded and the same are marked "Complainants' Exhibit No. 14, cylindrical brass tube with threaded tapered ends, C. M. R., spec. ex.")

(Complainants' counsel offers in evidence two similar pieces of brass tubing with the middle portions turned down and the ends taper threaded and the same are marked "Complainants' Exhibit No. 15, cylindrical brass tubes with tapered ends and turned down centres, C. M. R., spec. ex.")

(Complainants' counsel offers in evidence two similar pieces of brass tubing with the centre portions turned down and flattened and with tapered threaded ends and the same are marked "Complainants' Exhibit No. 16, model brass tubes with taper, threaded ends and turned down flattened central portions, C. M. R. spec. ex.")

(Complainants' counsel offers in evidence the Millett & Reed tube-spring with portions cut away showing joints in section and the same is marked "Complainants' Exhibit No. 17, Millett and Reed tube spring partly in section, C. M. R., spec. ex.")

Adjourned until Thursday, June 12, at 10 a. m.

68 BOSTON, *June* 12, 1902.

(Met pursuant to adjournment.)
(Counsel present as before.)

Direct examination of SAMUEL G. REED, continued :

A. I never made any experiments until the day in February 1899 on which the suggestion was made by Mr. Millett in our office at the factory when the subject of making gage tube-springs was under

discussion that we make them from brass tube of commerce, turn down and flatten the central portion and thread the ends. The question arose as to the efficiency of the joints and I made the suggestion to him in the discussion that the thread be made taper, which would by its jamming action, when turned into place, make the joint steam and water tight and at the same time allow us to bring the tube into its proper position with respect to the axis of the socket. There was a difference of opinion between us as to the efficiency of this method and during the discussion the other method was devised by which a straight thread should be used with a jam nut and some packing material to make the joint tight. During the day, the first method with the taper threads was tried. The tube taken was similar to the one I hold in my hand "Exhibit No. 14, cylindrical brass tube with threaded tapered ends," the threads being cut tapered just as here shown. The central portion was then turned to the proper thickness leaving the threaded portions as first made and the tube was then in the condition of the "Exhibit No. 15" which I now hold marked "Cylindrical brass tubes with
69 tapered ends and turned down centres." I then put the
tube into a form and flattened the central turned portion under a press and the tube was as is shown in "Exhibit No. 16," model brass tubes with taper threaded ends & turned down flattened central portions." I next bent the tube into the portion of a circle around a piece of metal in a vise. This tube then with a second made in the same manner were then screwed into a socket and provided with tips as is shown completed in "Exhibit No. 1, Millett & Reed tube-spring." These tube-springs when screwed into place were placed upon a boiler and live steam at 200 lbs. pressure turned directly into the tubes. The joints were found to be tight and no bad effects were caused by the temperature of the steam. The tubes as made in this experiment were the same as are now made in all our business of this type. I hold now "Exhibit No. 17, Millett & Reed tube-spring partly in section" which shows the parts screwed into place and with portions cut away at the joints to show the screw threads and their attachments.

Int. 18. You have just said that in making your experiment described by you you took a "brass tube of commerce" and turned it down and flattened the central portion, etc.; please state whether or not the brass tube of commerce is threaded or unthreaded and whether or not threading such brass tube of commerce was part of the work done by you in your experiment? A. The brass tube is bought by us in lengths of 10 or 12 ft.; the piece was cut by me from one of these lengths and the threads cut for this experiment. The brass tube of commerce has no threads.

Int. 19. Will you please at this time define what is meant
70 by the term "brass tube of commerce" stating in what form
or forms such tube is put upon the market, in what lengths and with what peculiar characteristics, if any? A. The brass tube of commerce to which I refer above is the plain cylindrical brass

tube furnished on the market for uses in piping for water or steam. It is furnished in plain straight lengths varying from 10 to 12 ft.

Int. 20. Will you examine Exhibit No. 9, model flat tubing for tube-spring, and say whether or not that is not an article of commerce, and if so how it appears upon the market? A. The sample tube is a piece of flattened brass tube made especially for gage springs. It is drawn by the makers in lengths of 10 or 12 ft. and is cut up for use into the lengths required for the tubes as desired by the purchaser.

Int. 21. Whether or not in the business of the Crosby Steam Gage & Valve Co. brass tubing is used to a greater or less extent and whether or not there is at all times more or less of it about the factory? A. Yes.

Int. 22. Whether or not this was so prior to the time of your invention and if so how long prior? A. We always have kept it in stock.

Int. 23. Will you look at the model I now hand you and describe it and in your description state in what respects it resembles and in what respects it differs from Exhibit No. 8, model steam pressure gage soldered tube-spring"? A. The model gage is a regular 6¾ inch brass gage for steam pressure made by the Crosby Steam Gage & Valve Co., principally for use on locomotives. In every respect it is the same as the gage marked "Exhibit No. 8," except the
71 tube-spring and socket, which in this gage are made with the
flattened brass tubes with taper screwed cylindrical ends, and are the tubes invented by Mr. Millett and myself.

(Complainants' counsel offers in evidence the model gage just described by the witness and the same is marked "Complainants' Exhibit No. 18, model steam pressure gage, Millett & Reed tube-spring C. M. R., spec. ex.")

Int. 24. State whether or not you and Mr. Millett applied for letters patent of the United States for said improvement made by you and if so state whether or not said improvement and said application are the foundation of this suit? A. We did and they are.

Int. 25. State whether or not before June 12, 1899 you and Mr. Millett were the original, first and joint inventors of the improvement in Bourdon tube-springs employed in steam pressure gages and just described by you not known or used by others before your invention or discovery thereof and not patented or described in any printed publication in any country before your invention or discovery thereof or more than two years prior to your application for patent therefor and not in public use or on sale for more than two years prior to your application for a patent therefor and not abandoned and whether or not any application for a patent on said improvement was before said June 12, 1899 filed by you or your representatives or assigns in any country foreign to the United States? A. We were; and there was not.

72 Int. 26. Had you before your described invention ever known of a brass Bourdon tube-spring having a threaded end either tapered or untapered? A. No.

Int. 27. Have you ever known of a steel Bourdon tube-spring being employed in a steam pressure gage? A. No.

Int. 28. What is a hydraulic pressure gage and for what purpose is it used? In answering this question will you employ the model gage I hand you, which is called a hydrostatic gage and will you state what difference there is, if any, between a hydrostatic gage and a hydraulic gage; state also where this model came from, if you know? A. The model gage is a regular 6¾ inch hydraulic gage made by the Crosby Steam Gage & Valve Co. of Boston. The term hydrostatic or hydraulic applies in either case to this type of gage and means it is a Bourdon gage designed especially for measuring pressures in hydraulic rams or presses. For this purpose a gage is demanded that will measure pressures sometimes as high as 20,000 lbs. per sq. inch and the Bourdon tube is made in these gages from steel hardened and tempered.

(Complainants' counsel offers in evidence the model gage just described by the witness and the same is marked "Complainants' Exhibit No. 19, hydraulic or hydrostatic pressure gage, C. M. R., spec. ex.")

Int. 29. Will you examine "Exhibit No. 3, steel Bourdon tube-spring for hydraulic gage" and say whether it is like the Bourdon tube spring shown in the hydraulic gage just described by you? A. It is, except that it has the ends cut away to show the screwed joints and solder.

73 Int. 30. To what extent is solder employed in the joints in these hydraulic pressure gages and what is the shape of the ends of the steel Bourdon tube used in these hydraulic gages and what is the nature of the threading on those ends? A. Solder is always used in the joints of the tube. The ends are cylindrical in shape and threaded with a straight thread.

Int. 31. Have you ever seen or known of a steel Bourdon tube-spring having a taper threaded end? A. No.

Int. 32. What are the advantages or disadvantages arising from the use of solder as you have described it in the joints of the steel Bourdon tube employed in hydraulic pressure gages and please give the reasons for your answer? A. The use of solder is in this gage necessary to make the joint tight under the high pressure the spring is subjected to. The spring being made of steel which is hardened, does not allow it to adapt itself to the material of which the socket is made, namely brass, and consequently solder must be used to fill the minute spaces which would otherwise exist in the joint. It also allows the spring to be brought to a position in line with the axis of the socket and to be locked firmly in position. The hydraulic spring is always used on apparatus in which there is no heat that would in any way affect the character of the joint and consequently the solder is not a disadvantage.

Int. 33. What is the advantage, if any, in having the ends of the steel Bourdon tube when used with a hydraulic pressure gage straight
threaded? I have reference particularly to the use of such
74 straight thread in enabling one to screw the tube into the
socket to any desired distance. A. It allows it to be brought into position in line with the axis of the socket.

Int. 34. Have you examined letters patent No. 643,876 granted to Lane for an improvement in pressure gages and are you familiar with the specification and drawings of said patent? A. I have and I am.

Int. 35. What particular attention have you given to the subject of mechanical drawing? A. I received a course of instruction in mechanical drawing at the Massachusetts Institute of Technology, have worked in various drafting rooms of manufacturing concerns and have charge of the drafting department of the Crosby Company.

Int. 36. Will you look at the drawing in said Lane patent and describe the ends of the Bourdon tube there shown in section. A. The end of the tube shown is the regular steel tube used in the hydraulic gage with a straight thread on its end.

Int. 37. Will you examine the model I now hand you and say whether or not that is the steel Bourdon tube-spring and socket shown in the Lane drawing or if it is not wherein it differs therefrom? A. It is the same. The section of the actual tube, however, shows the solder which is required to make the joint tight.

(Complainants' counsel offers in evidence the model steel tube-spring and socket just described by the witness and the same is
marked "Complainants' Exhibit No. 20, model steel tube-
75 spring and socket Lane patent, C. M. R., spec. ex.")

Int. 38. Will you compare Exhibit No. 20 with Exhibit No. 3 and say wherein they differ? A. Exhibit No. 3 differs from No. 20 in the socket end which is in No. 20 provided with a check valve designated to act to protect the spring when pressure is suddenly released from the gage when in actual use.

Int. 39. Whether or not said Exhibit No. 20 embodies the invention of said Lane? A. It does.

Int. 40. Whether or not your company makes the Lane improvement described in his patent and if so in what style of pressure gages is said improvement employed? A. It does. The improvement is employed only in hydraulic pressure gages.

Int. 41. Whether or not said improvement is ever employed in steam pressure gages and if not, will you briefly state the reasons why? A. It is not; because steam when the pressure is relieved acts expansively and makes it impossible to reduce the pressure suddenly enough to make any bad effect upon the gage tube. Hydraulic pressure when relieved drops almost instantly and the gage tube being subjected to a sudden shock sometimes destroys the accuracy of the gage and some device to check this sudden drop in pressure is absolutely necessary.

Int. 42. I notice in the Lane specification in several places such expressions as "flow of steam in or out of the gage;" "steam way or passage;" I will ask you whether or not such expressions define properly the actual state of facts in the use of the Lane device
76 and if not wherein they are erroneous? A. They do not because a hydraulic gage is never used for measuring steam pressures.

Int. 43. What expressions should be substituted for the expressions I have read if it is desired to express accurately the actual facts in relation to the use of said invention of Lane? and give the reasons for your answer? A. The term liquid should be used in this connection because it is only some kind of liquid that will ever enter the tube-spring.

Int. 44. Whether or not you find anything in the Lane specification or drawings indicating that his invention has anything to do with the method of attaching steel tube springs to the sockets of the gage or to the tips? A. I do not.

Int. 45. Will you state as a mechanical draftsman what the custom is in representing solder when drawings are made of joints in which solder is employed and will you state in connection with this matter what substantially is the thickness of the solder coating employed in connecting the screwed ends of a steel Bourdon tube-spring to a gage socket or a tip? A. In making a drawing of a soldered joint we would not represent the solder itself. The thickness would always vary in different joints and would differ in various parts of the same joint and therefore could not be represented as a part of the drawing. In no case would the solder be greater than two or three thousandths of an inch in thickness.

Int. 46. In a mechanical drawing if it became important to show that a joint was soldered, how would that fact be shown? A. By a note or description of the method employed in putting the two parts together.

77 Int. 47. I will ask you to state directly whether or not the ends of the steel tube-spring shown in the Lane drawing is tapered? A. No.

Int. 48. In January 1898, or to be more exact on January 17, 1898 what sort of a tube-spring was employed in a hydraulic pressure gage how was it fastened to the tubular head of the gage and to the tip and of what material was it made? A. It was fastened to the tubular head by a threaded joint which was made tight by solder and the threads were straight. The material was steel.

Int. 49. Will you examine the Lane specification page 1, line 46 where it says "the gage has a thread *b'*, to which the usual tube-spring C is secured" and say what on January 17, 1898 was "the usual tube-spring C," and describe it? A. It was a steel tube attached to the tubular head or socket by a straight threaded connection having the joint soldered.

Int. 50. State whether or not you have ever known of a tube-spring in a hydraulic pressure gage being joined to the tubular head of the gage or to the tip without the employment of solder to tighten the joint? A. I have not.

Int. 51. Why are Bourdon tube-springs made of steel when employed in hydraulic gages and of brass when employed in steam pressure gages? A. The pressures to be measured by hydraulic gages vary from 1,000 to 20,000 lbs. and it is necessary for this pur-
pose that the spring be made of material suitable to withstand
78 the stresses set up in them by these high pressures and also
be stiff enough to move under the action of the pressure only such a distance as to be employed to move the index for the gage reading. The steam pressure gage is used only for pressures under 500 or 600 lbs. and this use requires a material that will be more sensitive to lower pressures than the hydraulic requires. For these reasons the steel is adapted only for use in hydraulic gages and the brass for steam gages.

Int. 52. Will you state in what form is put upon the market the steel tubing from which steel Bourdon tube-springs are made? A. In straight plain lengths varying from 6 to 10 feet.

Int. 53. Will you now examine "Exhibit No. 18, model steam pressure gage Millett & Reed tube-spring" and say whether or not it is made from the drawing accompanying the application for letters patent in this suit? A. It is.

Int. 54. Will you please state what pressures are used in steam pressure gages and the effect of such pressures upon solder, giving briefly and in tabulated form the temperatures corresponding to various pressures in saturated steam? A. The temperature corresponding to — lbs. gage pressure is as follows:

Gage pres.	Temperature.	Degrees F.
50		297
100		337
150		365
200		387
250		405
300		417

79 Pressures varying from 5 to 300 lbs. are commonly used in steam boilers. Common solder is a mixture of equal parts of tin and lead and melts at a temperature of about 370 degrees which corresponds as shown by the table given above to a gage pressure of about 150 lbs. Whenever pressures are used beyond this point there is always a danger of the heat melting the soldered joints and destroying the gage.

Int. 55. Are you familiar with the term "superheated" as applied to steam and if so will you please define it? A. The temperatures given in the above table in answer to Int. 54 are the temperatures which correspond in saturated steam or steam that is being formed in a boiler in connection with water. Whenever this steam is passed through pipes that are heated to a higher temperature the steam itself is heated to a high degree but there being no water near it the pressure is no longer increased and the steam is then known as superheated steam and is practically a gas.

Int. 56. Will you state how or for what purpose railroads employ steam pressure gages and whether in such use said gages come under the influence or are affected by superheated steam and if so please state what the effect of such superheated steam upon such gages is? A. Railroads use the steam gages for the most part on locomotives but whatever their use if they are connected to boilers in which the steam is superheated the temperature being higher than that at which solder fuses the joint will always be destroyed.

Int. 57. I will ask you whether steam pressure gages employed by
railroads are as a matter of fact as a rule brought under the
80 influence of superheated steam? A. No, not as a rule yet
but the limit at which engines and boilers can be made
economically to withstand pressure has for the present been reached at about 250 lbs. consequently the present tendency is for the steam to be superheated and the same economy is effected as though the pressure had been increased, but the higher temperature is even more destructive in its action upon the gage tube when it is soldered.

Int. 58. Then I understand that the tendency today is to use superheated steam in the way you have described and that such use of superheated steam increases the temperature and increases the risk of melting the solder and brings about such melting of the solder sooner than such melting would occur under the same circumstances were no superheated steam used? A. Yes.

Int. 59. Will you state whether or not you know of the demand there has been for the new Millett and Reed gage and state whether or not that demand has been the same or greater or less than the demand for the former type of gage? A. I do and there has been a greater demand.

Int. 60. How much greater? A. Comparing the number of gages of this type that is the type shown by Exhibit # 18; 6¾″ brass gage sold in our last business year with the number made the year before these went into effect ending May 1, 1899 when we sold exclusively the type shown by Ex. # 8 the increase has been about 140%.

Int. 61. What is the relative cost of making the Millett &
81 Reed type of steam pressure gage as compared with that of
making the old type of steam pressure gage? A. It is less.

Int. 62. Do you know how the price of the Millett and Reed steam pressure gage compares with that of the steam pressure gages made and sold by competing companies, and if so, how? A. It is higher in price. This knowledge is brought to my attention constantly in our endeavors to produce our gages at such cost that we can put them on the market at a profit in competition with other makers.

Int. 63. Will you state the process of making a steel Bourdon tube-spring? A. The steel tube is furnished to us in straight lengths which are cut at our works to the length required for each gage. The first operation is to cut the screw thread on each end and turn the portion between the threads so that the thickness of the tube in this space will be what our experience has shown necessary for the successful working of the spring when completed. The spring is then filled with sand and has a cap screwed upon each end. It is then put into a fire and heated uniformly to a red heat and placed under a press which flattens the portion between the threaded ends. It is again heated and the tube is bent into its curved shape as used in a gage by turning it about a form. It is again heated and plunged into oil which hardens the steel. It is then taken out, the sand removed and the tube cleaned. It is again dipped into oil and this oil being set on fire the tube is heated to a lower degree than before but sufficient to partially anneal the tube or what is technically known as drawing the temper. A test is made with a file to see if this process is sufficient to leave the tube in the condi-
82 tion of what is known as spring temper. If it is not, it is
again dipped into oil which is again burned off and the tube again tested. The forming of the tube is then complete. It is screwed into its socket, soldered into place and has its tips screwed on and soldered and it is again tested to see if any flaws have developed or if the tube is strong enough to resist the pressure that it is designed to carry.

Int. 64. Will you state whether or not the steam pressure gage when in place and in use is subjected to any heat other than that already described by you and if so what? A. I have already described the influence of the heat in the steam on the tube and its joints but oftentimes a steam gage is placed in such position on or near the boiler or near the smoke flue of the boiler that it is subjected to the heat of the escaping gases which are themselves at a much higher temperature than the steam temperature. In this case the gage is destroyed just the same as if the temperature was on the inside of the tube.

Int. 65. Did you on Monday of the present week make any experiments with Bourdon tubes at the factory of the Crosby Steam Gage & Valve Co. and if so will you please state who were present and describe the experiments? A. I did make some experiments in the presence of Mr. Coit, counsel for the Commissioner of Patents, Mr. Singleton of counsel for the complainants and Mr. Foster of counsel for complainants. The first experiment was on a gage tube such as is used in the regular Crosby gages made after the type of the Millett & Reed invention. The spring was tested first on cold water pressure up to 300 lbs. per square inch. The spring
83 had not before been tested and it was found that one joint
leaked a little but this was remedied by substituting another

tip. The tube was next tested on direct steam and was found to be tight under a pressure of 300 lbs. per square inch and the tubes were in no way affected.

Int. 66. Will you examine the tube spring I now hand you and say whether or not that is the spring with which you experimented as you have just explained? A. It is.

(Complainants' counsel offers in evidence the spring-tube just described by the witness and the same is marked "Complainants' Exhibit No. 21, Millett & Reed tube-spring tested June 9, 1902, C. M. R. spec. ex.")

Int. 67. Please state whether you at the same time made any other experiments and describe them, if you did? A. I next tested a steel hydraulic tube-spring with its socket and tips screwed as tight as possible into place but without solder at the joints by placing this on the boiler and found that the same leaked at both joints as soon as pressure was turned into it. This same tube was afterwards tested by hydraulic pressure and found to leak at 200 lbs. pressure.

Int. 68. Will you examine the hydraulic steel tube-spring which I now hand you and say whether or not that is the one used in the test which you have just described? A. It is.

(Complainants' counsel offers in evidence the spring-tube just described by the witness and the same is marked "Complainants' Exhibit No. 22, hydraulic steel tube-spring tested June 9, 1902, C. M. R., spec. ex.")

Int. 69. Did you at the same time make any other tests and
84 is so will you please describe them? A. I did. I placed a
tube-spring with soldered joints at the tips and socket such as was in use in all gages before the invention of the Millett & Reed tube, on the boiler and turned the steam directly into the tube. In a few seconds the solder began to fuse and blow out in various places about the joints. An instant after one of the tips was entirely blown out of the tube and the steam escaped freely from the end of the tube. The steam pressure in this case was 240 lbs. per sq. inch.

Int. 70. Please examine the tube spring and the separate tip I now hand you and say whether they are the spring and tip you have just described and employed by you in your experiment? A. They are.

(Complainants' counsel offers in evidence the spring-tube and separate tip just described by the witness and the same are marked "Complainants' Exhibit No. 23, steam-pressure tube-spring tested June 9, 1902, C. M. R., spec. ex.")

Int. 71. Whether or not you made any other experiments at that time? A. I did not.

Int. 72. You have testified that you never saw and never knew of a hydraulic steel tube-spring with tapered threaded ends. I will

ask you whether such a tube made with tapered threaded ends could be effectively used without the use of solder? Please give the reasons for your answer. Of course I mean could a hydraulic gage furnished with such a tube be effectively used without the use of solder to strengthen the joints of said tube with the gage and
85 tip? A. It could not because the contact between the hardened steel of the tube and the composition of the socket would not always bring a joint that would be absolutely tight under such high pressure (I mean by these pressures up to 20,000 lbs. per sq. inch) as is sometimes demanded by hydraulic work. When the joint is soldered the solder completely fills all spaces that may exist between the two metals and effectively keeps the liquid from forcing its way into the spaces between the threads of the joint.

Int. 73. Will you please state how it happened in your opinion, if you have any on the subject, that in view of the fact that all the appliances used in the manufacture of hydraulic pressure gages and steam pressure gages were constantly for years about your factory, and in full view of the employees of your concern and assuming that the same general condition of affairs as to the presence of similar appliances existed in the other plants of other companies engaged in making hydraulic pressure gages and steam pressure gages; how it was in view of these facts that it never occurred to anyone employed in your factory or any other factory mentioned to make the form of brass Bourbon tube-spring which you and Mr. Millett devised and made and which is the foundation of this suit? A. Up to the time that the first gage spring of this type was made to test its efficiency, all experiments had been made upon the regular tube furnished for the manufacture of steam gages as represented by the piece of tube marked "Exhibit No. 9," which tube was of uniform section throughout its length and being flattened in section could not be made with screwed ends. The object of all other experiments had been to find a method of uniting this form of tube
86 to the tips and socket which had been unsuccessful. The suggestion having been made that a brass tube be formed with cylindrical ends threaded it was only necessary to find the successful method by which this joint could be made to resist the pressure without leaking. I cannot say why others have not thought of making tube-springs in this way except that no brass tube springs had been made with cylindrical ends before this time.

Int. 74. Have you taken out any United States patents for inventions made by you and if so please state what they are? A. I have; a patent for a straight-way valve which patent is assigned to the Crosby Steam Gage & Valve Co.

Int. 75. How are hydraulic pressure gages and steam pressure gages made by other manufacturers of such gages, having reference particularly to the tube-springs employed in such gages and the method of their attachment to the gage socket and the tips? A. They are made essentially as I have described in the answers to the previous questions with the exception of the tube-springs used in the Millett & Reed gago.

Int. 76. Will you please say whether the plants of other manufacturers of gages are equipped substantially with the materials and appliances with which or similar to those with which your plant is equipped? A. So far as I know, they are.

(Complainants' counsel offers in evidence the following patents: Ashcroft, September 8, 1857, No. 18,129, pressure gauge; Kayser, September 16, 1879, No. 219,735; pressure gage; Allison, Septem-
ber 21, 1880, No. 232,432, coupling for tubes; Fulton, No-
87 vember 14, 1882, No. 267,416; gage cock; Patterson, March
6, 1883, No. 273,591: tube coupling; Atwood & Slate, Jan. 6, 1885, No. 310,490; gage cock; Jürgens, December 25, 1888, No. 395,279; thermometer; Maule, November 8, 1892, No. 485,961; long joint coupling; Lane, February 20, 1900, No. 643,876; pressure gage; British; patent to Cowper, No. 12,889 of December 5, 1849, being the same as set up in the answer by the Commissioner of Patents and requests the examiner to properly entitle them in the cause.)

Int. 77. What experience, if any, have you had in reading Patent Office copies of patents? A. I have had experience in patent litigations as an expert and as such have had occasion to read over and explain many letters patent and in course of business have had occasion to frequently consult specifications of letters patent both of our own and of others.

Int. 78. Have you read and do you understand the patents enumerated in the answer of the Commissioner of Patents in this suit? and offered in evidence? A. Yes.

Int. 79. Will you please take up those patents in their order as set up in said answer and point out resemblances and differences existing between the improvement made by you and Mr. Millett and the devices described in said patents? A. In Ashcroft patent No. 18,129, dated Sept. 8, 1857 pressure gauge I find a Bourdon gage tube of flattened section the tube being re-enforced by having one inside of
the other. I find no screw threads for connecting the tube
88 to its tip or socket. The drawing shows a taper screw thread
B on the end of the socket for attaching the same to the steam pipe.

I find in Kayser, No. 219,735, dated Sept. 16, 1879, pressure gage, a gage fitted with a ground check valve. I find no reference to Bourdon tube-springs or the method of attaching the ends of the tube to the tips and socket of the gage. The drawing shows a taper thread on the end of the check valve for attachment to the gage socket.

In Allison patent No. 232,432, dated September 21, 1880, coupling for tubes, I find no reference to Bourdon gage tube-springs. The drawing shows a coupling by which two pipes may be joined in which the threads are disappearing threads,

In Fulton, No. 267,416, dated November 14, 1882 for a gage cock

I find the drawing shows a taper thread for connecting the gage cock to the boiler. The patent refers in no way to Bourdon steam gage tubes.

BOSTON, *June* 13, 1902.

(Met pursuant to adjournment.)
(Counsel present as before.)

Ans. cont.: In Patterson, No. 273,591, dated March 6, 1883, for a tube coupling I find this patent refers to a method of uniting tubes with re-enforced ends. The drawing shows taper screw threads such as ordinarily are used in coupling pipes or tubes. I find in this no resemblance to the Bourdon gage.

In Atwood & Slate No. 310,490, dated Jan. 6, 1885, for a gage
cock, I find the invention relates to an improvement in gage
89 cocks and valves connected to a steam boiler. The drawing
shows a taper screw thread connection but I find no resemblance to the Bourdon gage tube-spring.

In Jürgens, No. 395,279, dated Dec. 25, 1888, for a thermometer, I find that the invention relates to a steel thermometer for liquids. The Bourdon tube shown in this device is flattened in section and wound in a spiral form. No screw threads are shown for attaching its ends and from the form of the tube such attachment would be impossible. I find in this patent no resemblance to the Bourdon tube-spring with screwed ends.

In Maule No. 485,961, dated Nov. 8, 1892, for a long-joint coupling, I find it relates to a long screw coupling to provide a means by which a section of a steam pipe to which it is affixed may be readily removed without disturbing the other parts. I find the drawing shows the usual tapered thread and also a straight thread, both of which are used in making the connections but I find no resemblance to the Bourdon tube-spring.

In Lane, No. 643,876, dated Feb'y 20, 1900, for pressure gage, I find the invention relates to an improvement in a pressure gage provided with a valve which is part of the gage structure, which improvement relates to the valve only applied to a hydraulic gage. The drawing shows in this patent the usual hydraulic gage in which the spring and other parts of the mechanism are made in the way common to all hydraulic gages.

In Cowper British patent No. 12,889, dated Dec. 5, 1849, relating to pressure gages, I find that the only part relating to the method of joining gage tubes to the tubular head is found in the specifications as follows:

"The tubes may be fixed in various ways as for instance
90 by soldering or by a union joint as in Fig. 26 or by driving
a ferrule outside or inside the tube as shown in Figs. 27 and
28. In these figures the connecting piece T to which the tube is fixed serves for connecting it to the steam boiler or other vessel the pressure in which it is required to ascertain."

Fig. 26 of the drawings appears to show a Bourdon tube attached to its socket by means of a flange on the tube end which is held in place by a jam nut making what the inventor calls a union joint. The Bourdon tube is not screw threaded and the screw thread on the jam nut is not tapered.

Fig. 27 of the drawing shows a Bourdon tube attached to its socket by a ferrule driven over its end which in this case seems to be cylindrical but is not tapered nor screw threaded.

Fig. 28 shows a Bourdon tube attached to its socket by a ferrule inside of the tube end which appears to be cylindrical but does not show screw threads either straight or tapered to hold it in place. In none of these do I find any resemblance to the brass tube-spring having ends tapered and screw threaded.

(The drawings referred to in the answer of the witness concerning the Cowper British patent showing Figs. 26, 27 and 28 consist of blue prints kindly furnished by Mr. Coit of counsel for the defendant, stated by him to have been taken from the original drawings in the Patent Office.)

Int. 80. Do you find in any of the patents which you have just considered and as to which you have just testified:

A steam pressure gage in which the Bourdon tube spring is made of any metal other than brass, or is joined to the socket and
91 to the tips, or to either socket or tip, by a threaded joint either tapered or untapered? A. I do not.

Int. 81. Do you find in said patents a hydraulic pressure gage in which the Bourdon tube-spring is made of any metal other than steel, or joined to the socket and tip without the use of solder, or having a tapered threaded end? A. I do not.

Int. 82. Do you find in said patents a Bourdon tube-spring made of any metal having a tapered threaded end? A. I do not.

Int. 83. Do you find in said patents a brass Bourdon tube-spring having a threaded end either tapered or untapered? A. I do not.

Int. 84. Referring to your answer to Int. 60, I will ask you to describe how you reached the percentage of increase testified to by you as being 140 % and to state whether or not you have correctly stated the percentage of increase? A. I arrived at the percentage given in the following manner: In the business year ending May 1st, 1899, the last year in which we sold exclusively the old type of gage as shown by Exhibit No. 8, 6¾" *inch* brass gage, we sold 677. In the business year ending May 1st, 1902, in which year we sold exclusively the new type of gage as shown by Exhibit No. 18, 6¾" *inch* brass gage, we sold 1698. This shows an increase of over 150 %. I have made the comparison using the 6¾ inch gage as a type, that being the type used on locomotives to which as has appeared the gage is particularly applied. The figures I have just given show that the percentage is really a little over 150 %.

92 Int. 85. Will you look at Exhibit No. 21, the tube which was employed by you in the experiment described by you in answer to Int. 65 and say what is the maximum pressure of the gage

for which this particular tube-spring is designed? A. These tube-springs are made in various thicknesses for use under different maximum pressures. This particular spring was made for use on a 260 lbs. steam gage, as is indicated on the socket in the exhibit.

Int. 86. In your opinion, whether or not the joint between the Bourdon tube and the gage socket in the Lane patent (No. 643,876) constitutes a feature of the Lane invention? A. It does not.

(Complainants' counsel offers in evidence the union joint or union gage cock described by the witness in his answer to Int. 12 and the same is marked "Complainants' Exhibit No. 24 union gage cock, C. M. R., spec. ex.")

Int. 87. In answer to Int. 7 you have explained how a straight piece of the tube such as is shown in Exhibit 9 is made into a Bourdon tube and stated that the "tube is fitted to the socket." Will you please state how said tube is fitted to the socket and how held in place? A. It is held in place by solder.

(It is stipulated by counsel that a type-written copy and a blue print of the Cowper patent may be introduced in evidence in lieu of printed or official copies.)

Cross-examination.

By John M. Coit, Esq., of counsel for defendant:

93 X Int. 88. What is the business of the Lamson Co. mentioned by you in answer to Int. 2? A. At the time I was employed by them it was engaged in the manufacture of bicycle parts and a patent form of pipe wrench.

X Int. 89. How long did you work for this company and what did you do? A. I worked for them at two different times in all covering a period of about 6 months doing general machine work on a lathe and the bench.

X Int. 90. Will you please make the same explanation in regard to the Rollins Company and your work for it? A. I was employed by the Rollins Engine Co. at two different periods covering about 6 months, my work being here wholly drafting. The company is engaged in the manufacture of stationary steam engines. The particular work on which I was engaged was in designing compound engines for using steam pressure of about 150 or 160 lbs.

X Int. 91. Please make the same explanation in regard to the Atlantic works and your work there? A. I was in the employment of the Atlantic works for about 4 months as draftsman, working on the engine design and hull design of a revenue cutter they had in process of construction. The Atlantic works is engaged in ship building and ship repairs and general engine and boiler building.

X Int. 92. In your work for these three companies you were not engaged in making steam gages were you? A. I was not.

X Int. 93. In your work in the sales department of the Crosby Co. did you have anything to do with the making of the steam gages? A. I did not.

94 X Int. 94. Has the Crosby Co. been extensively engaged in the manufacture and sale of steam gages since its organization or at least since your connection with it? A. It has.

X Int. 95. If proper care is used, can a gage of your old type where the tube was soldered in place, be successfully used upon boilers of a high pressure in connection with the siphon mentioned by you in answer to Int. 6? A. It can.

X Int. 96. Such gages were in fact used by the railroad companies up to the time that your screw threaded type was put out, were they not? A. They were.

X Int. 97. Does the union joint shown in Exhibit 24 make a steam tight joint without the use of solder? A. It does.

X Int. 98. Is it well known to those skilled in the art that a union joint needs no solder to make it steam tight? A. It is.

X Int. 99. Do these joints stand the modern high pressure? A. They do.

X Int. 100. Could not a steam gage be made with a steel tube-spring? A. It could but the steel coming more or less under the influence of the dampness would cause the spring to rust and the walls being very thin the gage-tube would in a short time deteriorate. It would be impossible to make them of steel, however, for pressures below 150 lbs. on account of the stiffness of the material.

95 X Int. 101. Do you know of that having been tried? A. I do not.

X Int. 102. As a matter of mechanics, do not the hydraulic gage and the steam gage operate in the same way and differ merely in the sensitiveness of the spring-tube? A. They do.

X Int. 103. As far as your experience goes you understand that the tube-spring of the steam gage would have to be made of brass in whatever way it was fastened in place? A. I do.

X Int. 104. This has always been your understanding has it? A. It has.

X Int. 105. You state in answer to Int. 14 that the Bourdon tube was always soldered in the steam gage; please examine the British patent of Cowper and say whether in your opinion solder was intended to be used in the construction shown in Figs. 26, 27 and 28? A. I should say not.

X Int. 106. Am I to understand then that you mean that solder was always used in so far as the manufacture which came under your observation was concerned? A. You are.

X Int. 107. When Millett suggested to you the screw threaded Bourdon tube how did you happen to think of tapering the screw thread? A. I cannot say definitely now, except from the fact that I was acquainted with the requirements that the joint to be made effective must allow the spring to take its position with regard to

the axis of the socket and at the same time be capable of
96 holding any pressure to which the spring was to be subjected.
The straight thread in my opinion would not accomplish both of these purposes and I therefore suggested the taper as a possible solution of the problem.

X Int. 108. Did you before this time know of the use of tapered threads for making a steam tight joint? A. I did.

X Int. 109. Were such tapered joints in common use in the Crosby factory? A. They were.

X Int. 110. In your old form of steam gage were the threads corresponding to the threads marked c' in your application drawing made tapering? A. They were.

X Int. 111. Are the threads corresponding to c' in your application drawing always made tapering in your new steam gage? A. They are.

X Int. 112. Is any solder used in these taper threaded connections in order to make a steam tight joint? A. There is none.

X Int. 113. Did you have any doubt before trying it that the tapered threads on the Bourdon tube would make a steam tight joint? A. I did not.

X Int. 114. Before the suggestion by Millett of the screw threaded connection, did you know of any Bourdon tube having thickened screw threaded ends and a thin flattened middle portion? A. I did, the steel tube used in the hydraulic gage.

97 X Int. 115. If the threaded Bourdon tubes were manufactured in the way and with the tools used by you in making the first gage of that kind mentioned by you in answer to Int. 17, would the gages so made cost your company more than the old style of gage? A. I do not remember exactly the facilities we had at that time for cutting the threads on the pieces of tube but it is my opinion that gage tubes made in quantities by the same method would not cost very much different from the cost of the old soldered tubes.

X Int. 116. Didn't your company in fact devise or buy new machines for making these tubes? A. We have made over lathes to work to a certain extent automatically for cutting down the walls of the tube but the cutting action of the tool is the same as in the lathe before being made over. The only advantage being that one man can operate two machines for this operation where before only one could be used.

X Int. 117. Is the change in the lathe the only change made in your machinery for making this new tube? A. At first we bent the tube between forms in a hand vise but in order to get a machine by itself for this purpose we have constructed a vise using the old forms and made the machine a thing by itself.

X Int. 118. About when did you proceed with the manufacture of the gages having the screw threaded connection so far as to be able to put them on the market? A. During the summer and fall of 1899 we were preparing patterns and testing the device as we had made it and it was not until the end of the year that the tube-springs were produced in any quantity.

98 X Int. 119. From your statement in answer to Int. 33 I understand that the steel tube of the hydraulic gage is made with straight threads so that it can be readily brought into proper position and that the threads were made straight instead of tapering as a matter of convenience; is this correct? A. The straight thread furnishes this convenience but I do not know if it was the original reason for its adoption.

X Int. 120. Could not a tight joint be made between the steel tube and the brass coupling by a tapered screw threaded joint? A. Not under the pressures to which the hydraulic tube is sometimes subjected.

X Int. 121. Would it make a tight joint up to 300 lbs. to the square inch? A. It would, if nicely made.

X Int. 122. Is it not common to make a steam tight joint by tapered screw threaded connection between parts composed of brass and steel? A. It is but in these cases the steel parts would not be hardened thus making this part of the connection incapable of adapting itself to the adjacent metal of the other part, and thereby forming a joint that would be tight under pressure.

X Int. 123. Would there not be sufficient give to the brass to make the parts fit tightly even in that case? A. Not always.

X Int. 124. How do you know that the threads on the end of the tube-spring in Lane's patent are straight and not tapered?
99 A. The drawing shows a hydraulic gage and I have never known a hydraulic gage tube to be made with any other than straight threads. Moreover I have measured the threads shown on the tube end and as closely as may be measured under these circumstances, the threads are straight.

X Int. 125. Isn't it usual to show threads in a conventional way whether they are tapered or not that is are not both forms shown in the same way in a drawing unless there is some special reason for emphasizing the form of the thread? A. Different draftsmen have different ways or practices in regard to the necessity of showing threads complete or by a conventional method. In this case, however, the outside thread of the gage socket has a taper thread for connection to the pipe and the thread is shown in taper and I should assume that the other thread being drawn straight would mean that it must be straight in the actual case.

X Int. 126. Please examine your application drawing and state whether or not the threads *c′* are shown tapered? A. They are not.

X Int. 127. In the hydraulic gages made by the Crosby Co. has it been the custom as far back as 1897 to countersink the socket in which the Bourdon tube is placed for the purpose of soldering it in place? A. I cannot say definitely. The countersinking is not an essential portion of the joint but occurs from the workman cutting away the burrs produced by the tap. In some cases this would be greater than in others.

100 X Int. 128. You state that the solder used in the hydraulic tubes is only two or three thousandths of an inch in thickness, is this true of Exhibits 3 and 20? A. I should say it was in between the adjacent portions of the screw thread but in these exhibits there is an additional amount of solder beyond the screw threads which is run about the tube in a mass, which is much thicker.

X Int. 129. You state in answer to Int. 36 that the tube shown in the Lane patent is the regular steel tube used in hydraulic gages. Do you find any statement in the patent that the tube is made of steel? A. No.

X Int. 130. Is there any statement in the specification of that patent that the device shown in the drawing is a hydraulic gage? A. There is not.

X Int. 131. Would not that patent convey the idea to a person reading it that it was to be used for steam? A. I think it would.

X Int. 132. In view of the specific statement in the patent that it is to be used for steam, could anyone, whether skilled in the art or not, read the patent without having the idea suggested to them that it was to be used with steam? A. They could not.

X Int. 133. Are not your ideas of what the devise is that is shown in Lane's patent derived from your knowledge of what has been done with the invention embodied in it in the Crosby factory rather than from the patent itself? I am referring to the Bourdon
101 tube and the means for fastening it in place. A. They are.

X Int. 134. Does not the patent to Kayser show a valve in the pipe leading to a steam gage in about the position of the valve in Lane's patent? A. It shows a valve attached to the socket of the steam gage but in this case the valve is not an integral part of a gage socket but contained in a separate casing.

X Int. 135. Is it easier to work a brass tube into the form desired than a steel tube? A. It is because no heating is required.

X Int. 136. Would it be well known to one skilled in the art that a brass tube could be bent and flattened without heating? A. It would.

X Int. 137. You state that the Crosby Co. sold about 150% more steam gages of the 6¾ inch size during the year ending May 1st, 1902 than they sold of the old gage of the same size during the year ending May 1st, 1899. I would like to know if the company sold as many gages of this size during the year ending May 1st, 1899 as they had done in previous years? A. They did not.

X Int. 138. Were not the railroads and other consumers using as many gages of this size during that year as before and since? A. I am not competent to say exactly but if they were they were not bought from the Crosby Co.

X Int. 139. Was not the Crosby gage of that size put on the market in 1899 and the years immediately preceding it as good a gage as the gages made by other companies? A. It was.

102 X Int. 140. Was it made in substantially the same way as the gages of other companies? A. It was in so far as it was a double tube gage and had its spring made from flattened drawn tube with the tips and socket soldered.

X Int. 141. I understand then that the consumers purchased a less number of gages from your company during 1899 not because of any superiority of other companies' gages but for some other business reason, is this correct? A. As I have no direct connection with the selling of the company's goods and was not familiar with the conditions at that time, I cannot say positively what caused this falling off in the company's production of this kind of a gage.

X Int. 142. Referring to your test of Exhibit 22, were the threads in this device cut with the idea of making a tight joint without the use of solder? A. They were not, the tube used was a regular tube taken from stock.

X Int. 143. Could not the joints have been made tight if they had been made with care and with that idea in view? A. Not with straight threads.

X Int. 144. If the threads had been made tapering it would have stood the pressure to which it was subjected would it not? A. It might have.

X Int. 145. Did you do everything you could to make Exhibit 22 steam tight, that is in selecting the parts and fitting them together? A. I did.

103 X Int. 146. When you found that it leaked on the first trial did you substitute new parts and try it again? A. I did not.

X Int. 147. Was not the purpose of the test to show counsel for defendant that the joints would leak rather than an effort to make the joints so they would not leak? A. The purpose was to see if the joints would be tight.

X Int. 148. Do any other companies besides the Crosby Co. that you know of now use the screw threaded tubes in steam gages? A. So far as I know, they do not.

X Int. 149. You state in answer to Int. 73 that prior to your invention "no brass tube-springs had been made with cylindrical ends before this time;" is this statement correct in view of what is shown in British patent to Cowper? A. I do not know that any tubes were ever made as shown in Figs. 27 and 28 in British patent to Cowper. In my answer to the question I stated that no tubes had been made with cylindrical ends and this is true so far as I know.

Adjourned to Saturday, June 14, 1902, at 10 a. m.

104 BOSTON, *June* 14, 1902.

(Met pursuant to adjournment.)
(Counsel present as before.)

X Int. 150. Did you know of that patent or any publication disclosing flat Bourdon tubes with cylindrical ends in a steam gage before Millett's suggestion to you of the screw threaded tube in Feb'y 1899? A. I did not.

X Int. 151. Would in your opinion a joint made in accordance with Fig. 26 of Cowper's pat[illegible] be steam tight without the use of solder? A. Not as it is shown [illegible] the drawing.

X Int. 152. Would a mechan[illegible] skilled in the art of steam fitting if instructed generally to make [illegible] joint of the kind shown in Fig. 26 of Cowper's patent produce a s[illegible] tight joint? A. He would by inserting a packing or making a [illegible] joint.

X Int. 153. Would the use of [illegible] packing or ground joint naturally occur to him from his k[illegible] ledge of the art? A. Yes, it would.

X Int. 154. Would such a joint s[illegible] the modern high pressures as well as the lower pressures? A. [illegible]

X Int. 155. Would you say that [illegible] which Exhibit No. 23 was subjected as stated by you in [illegible] Int. 69 was under the same conditions as those to which [illegible] would naturally be subjected in use on a modern l[illegible] A. It often happens 105 that when gages are taken o[illegible] for inspection or adjustment that the sipho[illegible] have their water emptied from them and consequen[illegible] gage is replaced steam is turned directly into the gag[illegible] destruction in exactly the same manner as the test [illegible] with the Exhibit No. 23 showed. We have frequently [illegible] returned to us in which the evidences of steam in the g[illegible] plainly marked by the discoloration of the metal and [illegible] the soldered joints.

X Int. 156. I understand then that [illegible] may exist sometimes when the siphon becomes [illegible] they do not exist under normal conditions as a g[illegible] used? A. That is the right understanding.

X Int. 157. Are not many of these g[illegible] on high pressure locomotives? A. They are.

X Int. 158. About when did the us[illegible] steam say from 200 to 225 lbs. commence to [illegible] I say from 6 to 8 years ago but of course [illegible] rather indefinite.

X Int. 159. Has the use of high pressu[illegible] more common since that time? A. It has.

X Int. 160. Was it not usual in the us[illegible] gage to shield it from external heat as well as from [illegible] steam on the inside? A. At the present tim[illegible] gage wooden blocks to shield the gage by a[illegible] air between the gage case and its support the r[illegible] 106 away from the influence of heat which [illegible] conducted directly to them. I can[illegible] method was in use with the old gag[illegible] in effect.

X Int. 161. If you are able to make the [illegible] the machinery which you had in your factory in February, 1899 as stated by you in answer to X Int. 118, why did you not at once manufacture them? A. We always carry a large stock of parts ready to be assembled and before this new gage was put upon the market, we endeavored to use up as much as possible of these materials while we were testing the new device and making some experiments in regard to a material which would be best suited to make the tubes. This was being done during the summer and fall and I am under the impression that there were a very few orders filled from the new tubes during this experimental period but it was late in the year before they took the form of a regular production.

X Int. 162. Is it usual to couple pipes together or to a socket by screw threads without having the threads tapered? A. No, it is not.

X Int. 163. Did you ever try the jam nut type of coupling shown in your application? A. I did not.

X Int. 164. Would it in your opinion make a steam tight joint for the modern high pressures? A. It would.

X Int. 165. You have stated that the Crosby Co.'s new steam gage with the screw threaded tube was sold at a higher price than gages sold by other companies for the same kind of use; did your 107 company not advertise that you would sell the gage at no more cost than the gages of other companies? A. I don't know anything about it.

X Int. 166. Do you keep informed in regard to or have anything to do with the prices asked by the company for the goods manufactured by it? A. This part of the business is handled by another department and I have no information as to the selling prices of the company's products. I know merely that the goods must be produced to be sold within a certain amount and in a general way I know that our gages are sold at prices higher than our competitors' from the endeavor we are constantly making to keep the cost from increasing.

X Int. 167. Do you mean that you have positive knowledge that the gages are sold at a higher price or merely that this is your impression? A. It is my impression.

X Int. 168. I call your attention to the catalogue of the Crosby Steam Gage & Valve Co. issued in 1900 and ask if you find on page 5 thereof the following statement in reference to the steam gage constituting the subject matter of this suit: "Costing no more than any locomotive gage in use, we ask for it a careful consideration"? A. I do.

(Counsel for defendant offers in evidence the catalogue referred to furnished by the complainant and the same is marked "Defendant's Exhibit No. 1, Catalogue of Crosby Co., C. M. R., spec. ex.")

Redirect examination.

By R. W. FOSTER, Esq., of counsel for complainant:

108 R. D. Int. 169. You are asked in X Int. 105 whether in your opinion "solder was intended to be used in the construction shown in Figs. 26, 27, and 28" of the Cowper patent; and your answer is "I should say not;" will you please state on what you based your answer? A. I find in the specifications the following statement:

"The tubes may be fixed in various ways, as, for instance by soldering, or by a union joint, as in figure 26, or by driving a ferrule outside or inside the tube, as shown in figures 27 and 28."

This statement by stating that soldering is one method by itself shows by alternative that none was intended to be used in the devices shown in figures 27 and 28. From the use of the conjunction "or" I find three alternative methods given and simply from the use of the language I gather that it was intended as I have answered.

R. D. Int. 170. You have no knowledge have you, as to the intention of Cowper with regard to the use of solder other than that derived from the reading of his specification? A. I have not.

R. D. Int. 171. You have testified in [illegible] to cross interrogatories 152, 153 and 154 that a mechanic sk[illegible] the art of steam fitting if instructed generally to make a j[illegible] the kind shown in Fig. 26 of Cowper's patent would produc[illegible] a tight joint by inserting a packing or making a ground joint [illegible] that the use of the packing or ground joint would naturally [illegible] to him from his knowledge of the art; I will ask you wh[illegible] your testimony along the line just named you have in mind [illegible] skilled mechanic of to-day? A. I do.

109 R. D. Int. 172. Are you able to stat[illegible] you intended to state what a skilled mechanic in t[illegible] 1849, the date of the Cowper patent, would do in the premis[illegible] I am not and I have not.

R. D. Int. 173. Do you, find a ground joint [illegible]ing shown in Fig. 26 of Cowper's patent? A. I do not.

R. D. Int. 174. Have you intended to state w[illegible] occur to a skilled mechanic of the year 1849 as to the matter [illegible] discussion? A. I have not.

R. D. Int. 175. Are you able to state how the B[illegible]be-spring shown in Fig. 26 of the Cowper patent was made [illegible] any knowledge you may have other than from what you gather [illegible] the drawing and specification of said patent? A. I am not.

R. D. Int. 176. Have you any knowledge of the g[illegible]nditions surrounding the manufacture of steam gages or any knowledge of the pressures for which such steam gages were us[illegible] methods of making Bourdon tube-springs for such steam gages or of the method of joining Bourdon tube-springs to such gages or of any other matter relating to steam pressure gages in the year 1849 other than what you find in the drawing and specification of the Cowper patent? A. I have not.

R. D. Int. 177. Are you prepared then to give any opinion or information as to the state of the art in the year 1849 or as to the qualifications or skill of any mechanic in the matter under discussion in the year 1849? A. I am not.

R. D. Int. 178. Whether or not you find in the specification
110 of the Cowper patent anything relating to the construction of
Fig. 26, that is as to its details? A. I do not.

R. D. Int. 179. Are you able from Fig. 26 itself shown in the Cowper drawing to state clearly the details of said Fig. 26, and if so will you do so? A. I find a portion of a Bourdon tube held into its socket by a jam nut. That is all the detail there is.

R. D. Int. 180. Does the drawing show how the jam nut holds the Bourdon tube in place in Fig. 26? A. It does not.

R. D. Int. 181. In answer to X Int. 113 you say in speaking of the experiment made with your and Millett's new Bourdon tube-spring that you had no doubt that the tapered threads on the Bourdon tube would make a steam tight joint; will you state whether or not there was any doubt in your mind at that time as to the result of your experiment in any other particular than as to the tightness of the joint and if so will you state what the doubt was? A. There was a doubt as to whether the tube could be brought into its proper position when the threads had been screwed into the socket far enough to make the joint tight.

R. D. Int. 182. In answer to X Int. 129 you say that you find no statement in the Lane patent that the tube is made of steel and in reply to X Int. 133 you say that your idea of what the device shown in the Lane patent is is derived from your knowledge of what has been done with the invention embodied in it in the Crosby factory rather than from the patent itself; now please look at the specifica-
tion of said patent page 1, lines 44 to 49 where it says "the
111 socket B, by which the pressure gage is secured to the place
where the pressure is to be measured, is threaded at *b* in the usual way on the outside and within the gage has a thread *b'* to which the usual tube-spring C is secured;" also look at the drawing to which these letters B, *b*, *b'*, C refer on which drawing appears lettered on the dial the word "Hydraulic" and on which drawing appears also figures 3000, 6000, 9000, 12000, 15000 and state what kind of a gage you understand these words and figures marked on the dial apply to and also state what the "usual tube-spring C" is with regard to such understanding of what the drawing is and how said tube-spring must be constructed to be the "usual tube-spring" at the date of the application for the Lane patent, January 17 1898 used with such gage? Give the reasons for your answer. A. The marking on the dial of the gage shown in Fig. 1 shows the gage represented to be a hydraulic gage because the dial is marked with the word "Hydraulic" as well as the fact that it shows a capacity of 15,000 lbs. per square inch. The usual tube-spring in a hydraulic

gage was a steel spring united to its socket by straight screw threads which joint was made tight by solder. No hydraulic gage springs have been made in any other way than the one I have just described.

R. D. Int. 183. Please look at page 2, column 1 of the Lane specification and say whether or not you find there the expression or words "hydraulic valve" and if so how many times do you find that expression? A. I do; three times.

R. D. Int. 184. What is the definition of a hydraulic valve
112 as the term is employed in the Lane specification? A. It
refers to a check valve to be used upon hydraulic pressure.

R. D. Int. 185. Whether or not a hydraulic valve is ever used in a steam pressure gage? A. It is not.

R. D. Int. 186. I call your attention to the following language in the Lane specification, page 1, line 43 "In the drawings the letter A represents an ordinary pressure gage to which the invention is applied;" will you please look at the letter A in the drawings and say what kind of a pressure gage is there represented? A. A hydraulic pressure gage.

R. D. Int. 187. You say in answer to X Int. 146 with reference to a certain experiment that you did not substitute new parts and try the experiment again; will you please recall the experiment referred to and say why you did not repeat the experiment? A. The parts used were parts taken from our stock and in making the experiment I knew that the substitution of other parts would show only the same condition as was represented in the test and it was of no use to substitute others for those already tried.

R. D. Int. 188. Whether or not anybody of those whom you say were present at the test suggested a second test? A. They did not.

R. D. Int. 189. Will you please state when it was that you first knew that there were to be any tests, what preparation you made for such tests and where you gathered the material and articles with
which to make the tests? A. No preparation whatever was
113 made for making the tests. In showing the counsel for both
parties the methods of making gage tubes and gages, it was
suggested by Mr. Singleton that we test some of the pieces that were going through the processes I had been describing. These pieces were taken from the benches in the gage department and tried without any idea of selection or of special preparation. I had no intimation before this time that any tests were wanted or were to be made.

R. D. Int. 190. With reference to matters upon which you may base your knowledge of the prices at which the Crosby gages under discussion are sold as compared with the prices of gages of other manufacturers, I will ask you whether or not you have referred to you from the selling department of the Crosby Co. the selling prices of goods sold in competition in order to determine the cost of like ones made by your company? A. I have at times information sent me or given me in regard to the market conditions or the competition our goods are meeting and in this way become acquainted to a certain extent with what the relative prices of the goods made by the Crosby Co. are in comparison with those of its competitors.

R. D. Int. 191. Then I will ask you whether or not when you are asked in X Int. 167 whether you have positive knowledge that the gages are sold at a higher price or whether that is merely your impression and you answer "It is my impression;" whether or not such impression is based on the knowledge you have just testified comes to you from time to time? A. It is.

114 Recross-examination.

By John M. Coit, Esq., counsel for defendant:

R. X Int. 192. You state that you have no knowledge of what a mechanic would have done in 1849 if instructed to make the joint shown in Fig. 26 of Cowper's patent; I would like to know whether you as a person skilled in this art would have between the years 1890 and 1895 been able to make a steam tight joint from the disclosure in Fig. 26 of Cowper's patent and the description thereof? A. Not by following the drawing as it is shown but such a joint I could have made.

R. X Int. 193. Would any mechanic skilled in steam fitting between the years mentioned if instructed to make a joint shown generally in Fig. 26 of Cowper's patents, have produced a steam tight joint without further instructions? A. He would not.

R. X Int. 194. Why would he not? A. Because the drawing does not show how the spring is held in place and how the joint is made.

R. X Int. 195. Is not the tube-spring provided with a flange at the end against which the jam nut bears? A. I find a flange is apparently shown on the end of the spring but this does not suffice to keep the spring from turning nor does it provide against leak when the device is under pressure.

R. X Int. 196. Does not the reference to this in the description of the patent as a union joint necessarily imply that there is a flange at the end of the tube? A. I think it does.

R. X Int. 197. Would not any mechanic skilled in the art of steam fitting have known enough between the years 1890 and
115 1895 to have provided the device shown in Fig. 26 of Cowper's patent with packing or a ground joint if he was instructed to make a device of that kind steam tight? A. Yes; I think he would.

R. X Int. 198. Are not many improvements in pressure gages applicable to either the steam or the hydraulic gage? A. They might be.

R. X Int. 199. Please examine the patent to Ashcroft and see if there is a statement therein that the invention is applicable to either form? A. There is.

R. X Int. 200. When Exhibit 21 was tested at the factory on June 9th and it was found that it leaked on the first trial, did any of those present suggest to you that you substitute a new plug for the one in it or did you think of that yourself? A. No one suggested it, that I remember.

R. X Int. 201. In R. D. Int. 181 you state that there was doubt as to whether the tube with the tapered end could be brought into proper position when screwed tight; did you know at this time that questions of this kind had arisen before that time in regard to other devices employing tapering screw threads? A. I did. The trouble in this case which we thought might arise was on account of the thinness and form of the tube which might possibly be destroyed in bringing the joint tight and leaving the tube in its proper position. The question was if the method was practicable.

Redirect examination.

By R. W. Foster, Esq., of counsel for complainant:

116 R. D. Int. 202. Assuming that the tube in Fig. 26 of the Cowper patent is furnished with a flange will you state briefly the different methods of making the tube with a flange? A. The tube could be turned down leaving a flange on its end or second the flange could be spun on the end of the tube; third it could be made in the form of disc and brazed or soldered into position.

R. D. Int. 203. Do you find anything in the specification or drawings of the Cowper patent to indicate which if any of these methods was employed? A. I do not.

SAMUEL G. REED.

Deposition of Frederick Lane.

Direct examination by R. W. Foster, Esq., of counsel for complainants:

Int. 1. What is your name, age, residence and occupation? A. Frederick Lane; age 47, residence 55 Francis St., Malden; assistant superintendent of Crosby Steam Gage & Valve Co.

Int. 2. Please state how long you have been in the employ of said company, what your duties have been in the past and what they are now? A. I have been with the company about 9 years, first as special salesman for the sale of novelties, and in November 1896 I became assistant superintendent at the factory which position I have held ever since. General duties of assistant superintendent.

Int. 3. Whether or not you are a machinist by trade and whether or not you are familiar with the manufacture of pressure gages. A. I am.

117 Int. 4. Have you taken out any United States patents? A. Yes, six or seven.

Int. 5. Did any of these patents relate to pressure gages and if so what inventions did they cover? A. Two relate to pressure gages and one was for a hydraulic check valve and the other was for an illuminated dial for pressure gage.

Int. 6. Are you the Frederick Lane mentioned in patent No. 643,876? A. I am.

Int. 7. Will you please state briefly the nature of your invention described in said patent No. 643,876 and say to what kind of a pressure gage it applies? A. The invention is the application of a check valve to the socket of a pressure gage commonly known as a hydraulic gage.

Int. 8. Did you make the drawings filed with your application for this patent? A. I did not.

Int. 9. Do you know who made them? A. They were made by R. H. Marsh, draftsman for the company at that time.

Int. 10. Is Marsh now in the employ of said company? A. He is not.

Int. 11. How long since he left the employ of said company and where is he now if you know? A. I don't know where he is now; he left the company about three years ago.

Int. 12. Please state if you know whether he made the drawing in question from a model and if so what the model was? A. 118 He made the drawing from a model so far as it shows the usual hydraulic gage. The rest of the drawing was made from a sketch furnished by me.

Int. 13. What was his model in making a drawing of the gage? A. An ordinary hydraulic gage of commerce taken from our stock.

Int. 14. Did you draw the specification for your application in this patent? A. I did not.

Int. 15. On page 1 of the specification line 43 I find the words "In the drawings the letter A represents an ordinary pressure gage to which the invention is applied;" will you please look at the drawing and at the letter A on said drawing and say what sort of a pressure gage said drawing shows? Give the reasons for your answer? A. It is a hydraulic gage. I would know that by first the pressure indicated on the dial, 15,000 lbs. the word "hydraulic" and that part of the tube-spring which is shown.

Int. 16. Whether or not the tube-spring there shown is the usual tube-spring at that time employed in a hydraulic pressure gage? A. It is.

Int. 17. Will you state of what metal the usual tube-spring employed in a hydraulic pressure gage in January 1898 was made, how its ends are connected to the socket of the gage and to the tip? A. The tube spring is made of steel; its ends are threaded with straight thread; one end is screwed into the socket, the other end the tip is screwed onto.

119 Int. 18. Whether or not solder was used in making these joints just described by you and if so to what extent? A. Solder was used and always has been used so far as my knowledge

goes and is used at the present time in making these joints, in every instance.

Int. 19. In view of your invention and of the method in which tubes were made and fastened in hydraulic pressure gages at the time you made your invention, I will ask you to define “the usual tube-spring C” mentioned on page 1, line 48 of your specification? A. The usual tube-spring C was made of steel both ends threaded one end was screwed into the socket and the other and the tip screwed onto it. These threads were straight and the joints soldered.

Int. 20. I notice in your specification page 2, column 1 you use the expression several times “hydraulic valve” please state with what sort of a pressure gage a hydraulic valve is employed? A. A hydraulic gage?

Int. 21. Is a hydraulic valve ever employed in a steam pressure gage? A. It is not.

Int. 22. What sort of a gage did you have in mind when you made the invention we are discussing? A. A hydraulic gage.

Int. 23. Whether or not you had in mind a steam pressure gage or the application of your invention to a steam pressure gage. A. I did not have a steam pressure gage in mind neither did I intend to apply the valve to steam pressure gages.

120 Int. 24. Will you state whether or not the Marsh who made the drawings as you have testified was under you as assistant superintendent at the factory? A. He was.

Int. 25. How was a steam pressure gage made with particular reference to the Bourdon tube-spring and the method of fastening said spring to the socket of the gage and to the tip prior to the winter of 1898–1899? A. The tube-spring was made of brass tubing rolled into shape the tips were soldered in and the spring was soldered to the sockets. The tubing was either flat brazed tubing or oval seamless drawn tubing. The flat brazed as shown in Exhibit No. 10 and the oval as shown in Exhibit No. 4.

Int. 26. Whether or not at or about that time you made any experiments relative to the method of fastening the tube-spring of a steam pressure gage to the gage socket and to the tips and if so will you please state of what your experiments consisted? Please use the devices I now hand you to illustrate your answer? A. I did make experiments about the time mentioned. They consisted in various trials to fit a cap over the tubing to be pressed on by the action of dies tending to press the cap around the tube, said cap being first formed to fit the tubing as perfectly as possible. Inside the tube was fitted a plug between which plug and the outside cap the walls of the tubing were compressed.

Int. 27. Will you examine the piece of brass tubing which I now hand you and say whether or not that is the original piece of tubing which you employed in the experiment just described by you? A. It is.

121 (Complainants' counsel offers in evidence the piece of brass tubing just described by the witness and the same is marked

"Complainants' Exhibit No. 25, Bourdon tube, Lane's experiment, C. M. R., spec. ex.")

Int. 28. Will you please examine the device I now hand you and say what it is and whether or not it embodies a tube like the one you have just described? A. This is a form of steam gage known as thermostatic. The springs shown are the same as in the last exhibit with the exception that these are curved whereas the other was straight.

Int. 29. Will you once more examine patent No. 643,876 and say whether or not you find in the specification of said patent in various places the word "steam" and say whether or not such word properly describes any feature of the invention embodied in said patent. A. I find the word "steam" used more or less throughout the specification; it has not any relation to my invention.

Int. 30. If your invention were properly described in said specification, what word or words should be substituted for the word "steam"? A. The word "fluid" would be more properly used.

Int. 31. As I understand you steam has nothing to do with hydraulic pressure gages and your invention had nothing to do with steam pressure gages; am I correct? A. You are.

122 (Complainants' counsel offers in evidence the thermostatic pressure gage described by the witness in answer to Int. 28 and the same is marked "Complainants' Exhibit No. 26, thermostatic gage, Lane experiment, C. M. R., spec. ex.")

Int. 32. Will you please state with what success, if any, your experiments met? A. They met with no success.

Cross-examination.

By JOHN M. COIT, Esq., of counsel for defendant:

X Int. 33. Was the illuminated dial referred to by you in answer to Int. 5 intended for use on a steam or a hydraulic gage? A. On a steam gage.

X Int. 34. Could it also be used on a hydraulic gage? A. It could.

X Int. 35. How do you know that the draftsman in making the drawings of your patent No. 643,876 made them from an ordinary hydraulic gage? A. I saw the gage.

X Int. 36. Did you see him making the drawing from the gage? A. I did.

X Int. 37. Could the valve shown in your patent be used with a steam gage? A. It could be.

X Int. 38. Did you read the application for your patent over before signing and making oath to it? A. I presume I did. I don't remember.

X Int. 39. If your device was not intended for use with steam why did you permit it to be described as used for steam? A. I don't know.

123 X Int. 40. When did you make Exhibit 25? A. As near as I can remember in the fall of 1898.

X Int. 41. Did you test this exhibit to see if the joint were steam tight? A. I did.

X Int. 42. How high a pressure was used in these tests? A. 300 lbs. per sq. inch.

X Int. 43. How was the steam admitted to the tube? A. Through a small hole in the central portion of one edge of the tube.

X Int. 44. I understand then that the steam inlet tube was screwed into this small opening? A. Yes.

X Int. 45. When was Exhibit 26 made? A. In the fall of 1898.

X Int. 46. I notice some writing on this exhibit; please examine that and see if it refreshes your memory in regard to the date? A. It does; the writing is "Taken off 6/9/98." This exhibit was put on in February, 1898. In this connection I would like to state that the date given in the manufacture of Exhibit 25 was a wrong one and should have been a year earlier or 1897.

X Int. 47. Am I to understand that the exhibit was taken off of a boiler where it was being used on June 9, 1898? A. It was taken off of a boiler where it was being tested on that date.

X Int. 48. Who placed the writing upon this exhibit? A. I did.

X Int. 49. In this exhibit how does the steam get into the
124 spring-tube? A. Through a hole in the socket also a hole
through the tip or cap over the socket end of the spring-tube.

X Int. 50. How is the connection between the cap on the lower end of the tube and the socket made? A. By a hole drilled through it meeting a hole in the socket. There is a cylindrical projection from the cap which fits into a round hole in the socket tightly. The two parts are put together and staked or swaged in.

X Int. 51. This cylindrical projection has a hole bored longitudinally through it for the passage of the steam, has it not? A. It has.

X Int. 52. Did this device leak in the joint formed by staking the projection into the socket? A. It did.

X Int. 53. How did you happen to leave this exhibit on the boiler from February until June if it leaked? A. It did not leak at first and several experiments were tried on this exhibit before it was taken off.

X Int. 54. When your application for a patent was prepared did you describe your invention to the person who was preparing it? A. I don't remember.

X Int. 55. You described it to somebody, did you not? A. I did.

X Int. 56. Who did you describe it to? A. I don't remember.

Redirect examination.

By R. W. Foster, Esq., of counsel for complainants:

R. D. Int. 57. Whether or not in describing your invention
125 to anybody you had occasion to use the word "steam"? A.
I did not.

R. D. Int. 58. Can you say whether or not you used the word "steam" in describing your invention to anybody? A. I did not.

R. D. Int. 59. In answer to X Int. 37 you say your valve could be used in a steam gage; did you ever know of its being used in a steam gage? A. I did not.

R. D. Int. 60. Is it applicable to a steam gage? Give your reasons. A. It is not. It would be of no advantage.

R. D. Int. 61. You say in answer to X Int. 39 that you don't know why the device described in your patent is described as used with "steam;" when you applied for your patent did you do so through the company's solicitor and leave the matter to him? A. I turned the matter over to the president of the company.

FREDERICK LANE.

(Complainants' counsel offers in evidence a printed copy of the "Transcript of Record," Court of Appeals, District of Columbia, January term, 1901, serial No. 5602," and the same is marked "Complainants' Exhibit Transcript of Record—C. M. R., spec. ex.")

(It is agreed by counsel for both parties that the complainants, Millett and Reed, duly made an application for letters patent of the United States for their invention to the Commissioner of Patents, and that said application was in all respects regular and was filed February 17, 1900.)

126 (Complainants' counsel offers in evidence the printed copy of the petition, specification, oath, and drawings, included in the application for letters patent made by the complainants, Millett and Reed, to the Commissioner of Patents, as such copy appears in "Complainants' Exhibit Transcript of Record," on pages 2 to 8 (inclusive) thereof; the drawings being inserted in said "transcript of record" between pages 22 and 23; said copy constituting part of said Exhibit "Transcript of Record.")

(Complainants' counsel offers in evidence the Official Gazette of August 6, 1901, vol. 96 No. 6, and the opinion of the court in the case of Millett and Reed *v.* Duell, Commissioner of Patents, printed on pages 1241 and 1242 thereof, and the same is marked "Complainants' Exhibit O. G. August 6, 1901, Opinion of Court—C. M. R., spec. ex.")

Complainants rest.

In order to avoid the necessity of calling other witnesses, it is hereby stipulated by and between counsel, and at the suggestion of the counsel for the defendant, that the witnesses Johnson and Freeman, if recalled, would testify that it was not their intention to convey any idea or suggestion, when testifying, that the railroad companies which bought Crosby's new gage removed other gages which were in good condition from their engines to substitute the new gage, or that the gages which were given to the Crosby Company in exchange were in good condition.

Defendant rests.

UNITED STATES PATENT OFFICE.

FREDERICK LANE, OF BROOKLINE, MASSACHUSETTS, ASSIGNOR TO THE CROSBY STEAM GAGE AND VALVE COMPANY, OF BOSTON, MASSACHUSETTS.

PRESSURE-GAGE.

SPECIFICATION forming part of Letters Patent No. 643,876, dated February 20, 1900.

Application filed January 17, 1898. Serial No. 666,934. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK LANE, a citizen of the United States, residing at Brookline, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Pressure-Gages; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to an improvement in pressure-gages, more especially to an improvement in a pressure-gage provided with a valve which is a part of the gage structure. Heretofore the valves for such gages have been separate from and connected to the gages; but in my invention the valve is made a part of the gage structure, so that when the gage is put in place the valve is there ready for operation.

The object of the invention is to provide a pressure-gage with a valve of such construction that in the ordinary and usual use of the gage the steam may pass in and out with a steady pressure, but in case of any rapid variation or fluctuaton of the flow of steam in or out of the gage there will be no shock, as the valve will permit only a steady flow of steam and acts as a buffer against any violent expansion.

To this end the invention consists in providing a pressure-gage with a steam way or passage which permits the flow of steam when under a steady pressure, but is choked when there is a sudden expansion.

In the annexed drawings, Figure 1 represents a face view of a gage provided with the invention, a portion being shown in section, so as to display the invention. Fig. 2 shows an enlarged perspective view of the interior piece which is to be inserted into the socket.

In the drawings the letter A represents an ordinary pressure-gage to which the invention is applied. The socket B, by which the pressure-gage is secured to the place where the pressure is to be measured, is threaded at *b* in the usual way on the outside and within the gage has a thread *b'*, to which the usual tube-spring C is secured. Outside of the gage A the socket B has a threaded bore b^2, and from this bore there leads a passage b^3, which communicates with the interior of the tube-spring C. Within this threaded bore b^2 is inserted a shell D, threaded on the outside to engage the threads of the bore b^2 and also threaded on the inside, the threads being shown at *d* and *d'*. In the closed end d^2 of the shell D is made a central passage d^3. Within the shell D is a plug E, the exterior threads *e* of which engage the interior thread *d'* of the shell D. This plug E has a central bore or passage *e'*. This plug E is inserted into the shell D far enough to leave a chamber F, within which is placed a ball G. At the top of the plug E the bore *e'* is countersunk, as shown at e^2, and around the edge of the countersink are made several notches e^3. Also at the bottom of the passage d^3 there is another countersink d^4, provided with notches like the notches e^3. The length of the chamber F should be less than the diameter of the ball G. The parts are put together as clearly shown in Fig. 1 of the drawings, the ball G resting in the countersink e^2 and away from the countersink d^4.

The operation is as follows: When this gage with the ball-valve is attached to any receptacle within which there is a pressure to be measured by it the pressure passes upward through the central opening *e'*, Fig. 1, past the ball G, resting on its seat due to the notches e^3, thence onward and upward through the passages into the interior of the tube-spring, where it is exerted in the usual way therein. This is the course when the pressure is constant and certain; but should there be an intermittent and impulsive flow then the ball G would be suddenly forced upward against the seat of the piece or shell D and there resist this impulse and allow the pressure to pass into the gage more slowly and continuously through the notches upon this seat and save the mechanism of the gage from the shocks it would otherwise receive to its detriment or destruction. The same principle is applied in the withdrawing of the pressure from the gage arising from its sudden releases or the fracturing of any part of the mechanism to which it may be attached. In such case it will be observed that the ball G falls to the lower seat and there prevents any shock to the gage mechanism, with the results above stated.

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Patented Feb. 20, 1900.

No. 643,876.

F. LANE.

PRESSURE GAGE.

(Application filed Jan. 17, 1898.)

(No Model.)

Fig. 1.

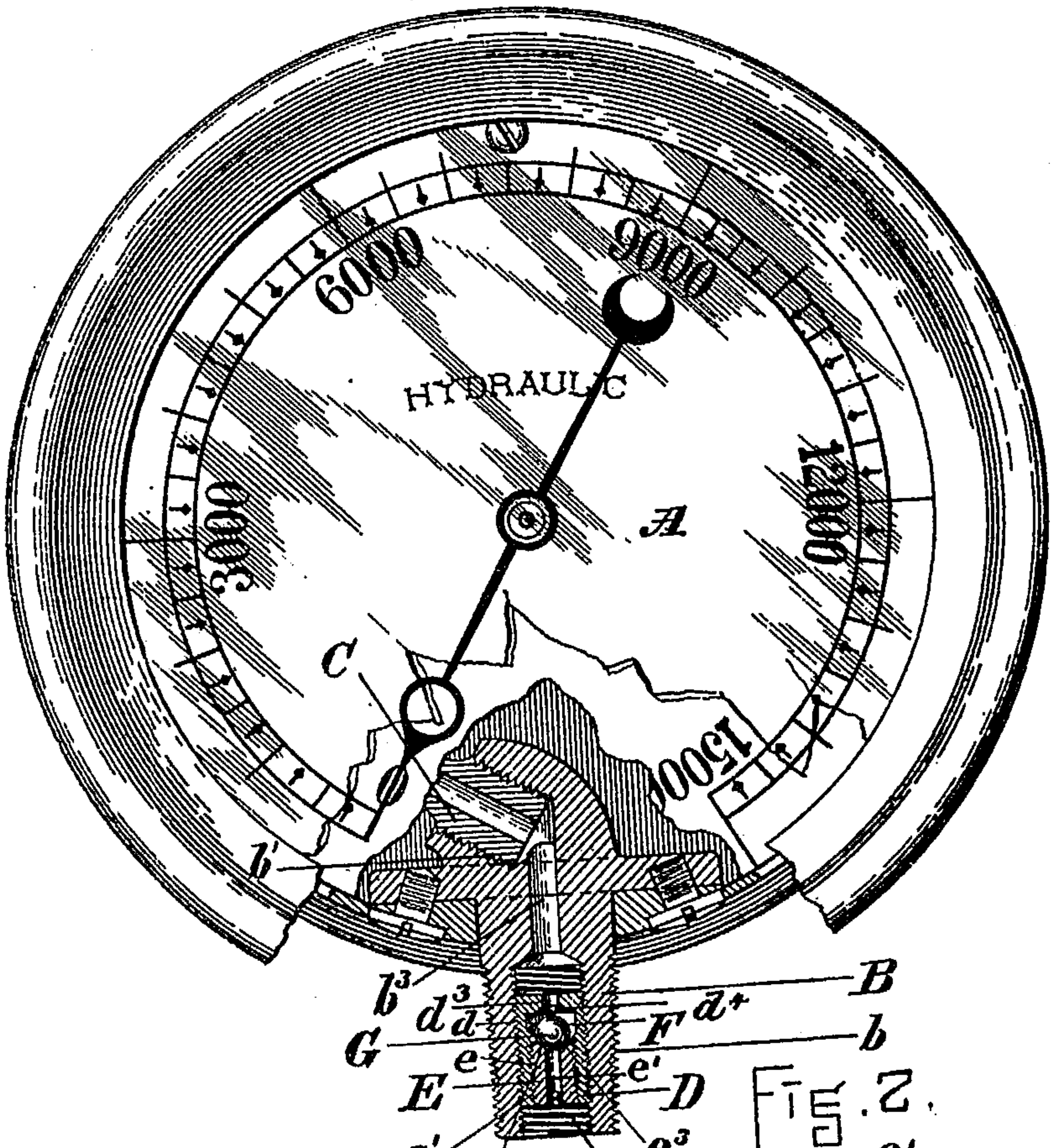
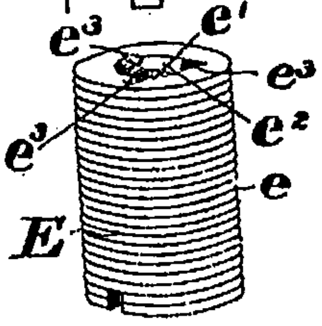


Fig. 2.



WITNESSES.

J. C. Finney.

INVENTOR

Frederick Lane.

per W. H. Singleton
Atty

THE NORRIS PETERS CO. PHOTO-LITHO., WASHINGTON, D. C.

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UNITED STATES PATENT OFFICE.

FREDERICK LANE, OF BROOKLINE, MASSACHUSETTS, ASSIGNOR TO THE CROSBY STEAM GAGE AND VALVE COMPANY, OF BOSTON, MASSACHUSETTS.

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To all whom it may concern:

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communicates with the interior of the tube-spring C. Within this threaded bore b^2 is inserted a shell D, threaded on the outside to engage the threads of the bore b^2 and also threaded on the inside, the threads being shown at *d* and *d'*. In the closed end d^2 of the shell D is made a central passage d^3. Within the shell D is a plug E, the exterior threads *e* of which engage the interior thread *d'* of the shell

E. H. Ashcroft.

Pressure Gauge.

No. 18,129. Patented Sep. 8, 1857.

Fig. 2.

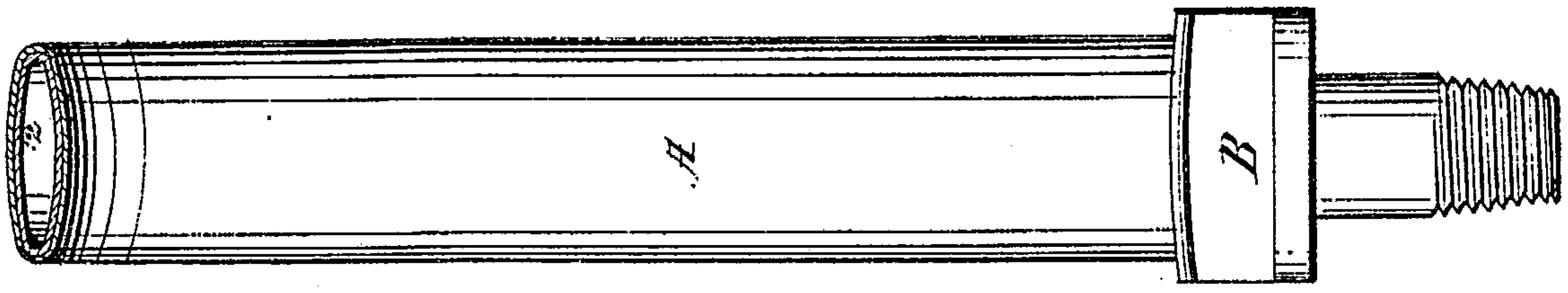
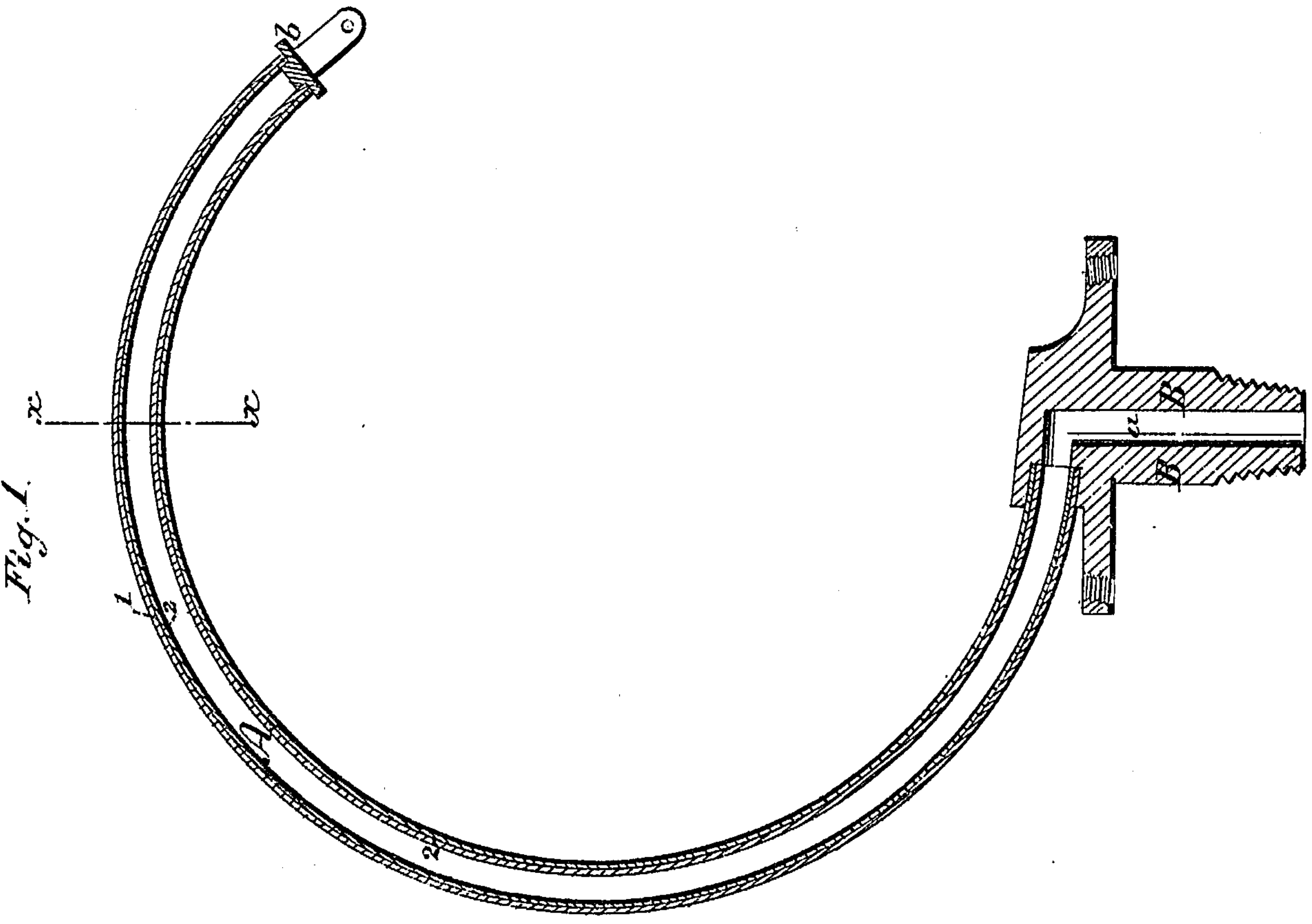


Fig. 1.



N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

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Now the advantage of this device is that the valve and gage are a concrete thing and coöperate in operation, to the constant preservation of the gage itself. Moreover, the device shown is such as to render the cost of a gage having a hydraulic valve very much less than if the gage and valve, being independent things, were united as now and heretofore. Besides this, when pressure-gages are made with this valve addition the user is certain of having one that will be free from injury or destruction in use where shocks or impulses may be common, when he would not be so free in the use of the ordinary pressure-gage without the hydraulic valve, and it is a fact that many users to-day use a gage for measuring high pressure without the precautionary device of a hydraulic valve to save them from injury in such circumstances; the result of which is a frequent breakage and injury to gages, to the loss of the user.

Having described my invention, what I claim is—

The combination, in a pressure-gage, of a case; the socket secured therein having an interior passage and threaded inside and outside; the tube-spring within the gage and having its interior communicating with the interior of the socket; a shell threaded on the outside placed within the socket and engaging the threads in the inside thereof, such shell having a passage therethrough; a plug within the shell, such plug having a bore or passage and engaging the shell with threads, there being a chamber between the inner end of the plug and shell, the passages leading into such chamber above and below being countersunk and having notches, and the ball-valve placed in such chamber, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK LANE.

Witnesses:
JOSHUA H. MILLETT,
ARTHUR L. BOWKER.

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FIG. 26.

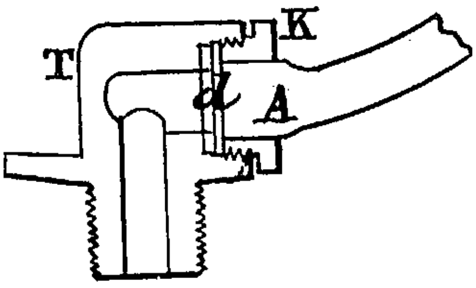

FIG. 27.

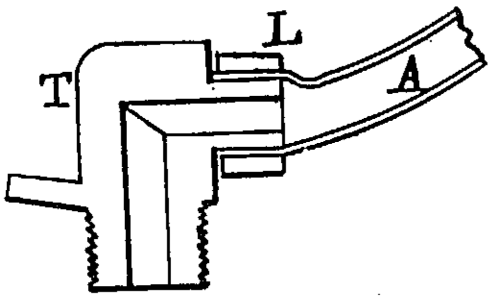

FIG. 28.

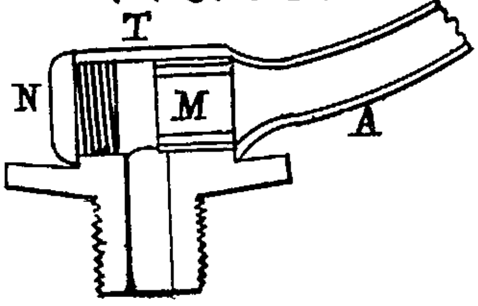

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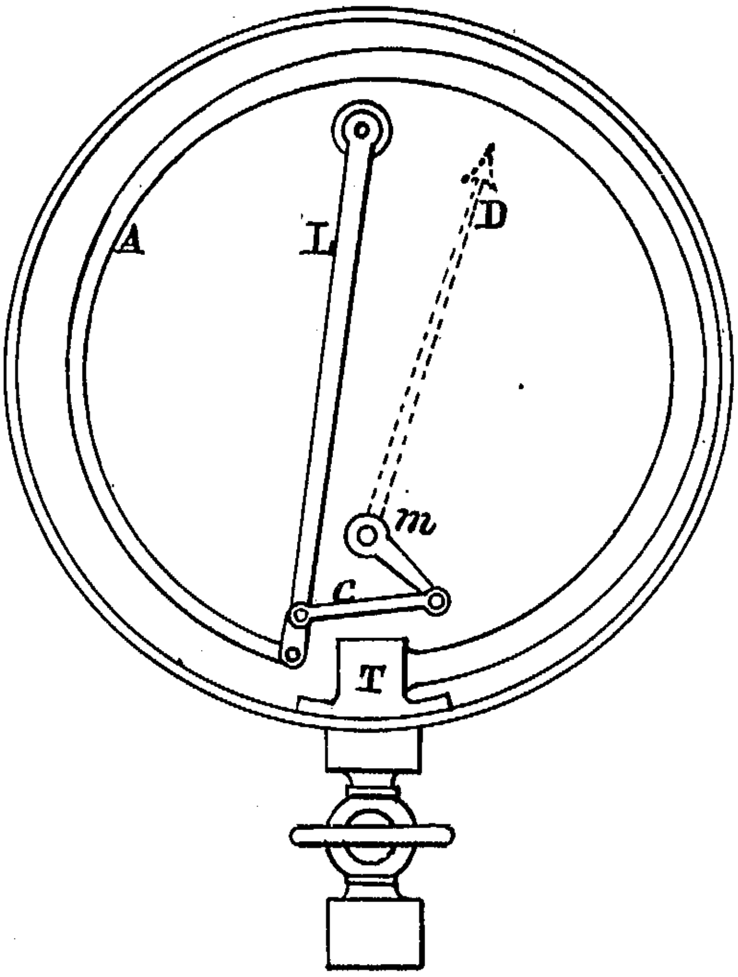
FIG. 35.



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Allen } 181

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158 The invention relates to the construction of instruments for measuring, indicating, and regulating pressure and temperature, and for obtaining motive power, by means of tubes of metal or other suitable material arranged in various forms, and in some of which a vacuum is formed, whilst in other arrangements air, steam, water, or other fluids are introduced. The form and section of the tubes are such as to cause them to undergo a change in their form when they are submitted to internal or external pressure. For this purpose I employ tubes whose transverse section is of any form other than a circle, and I distort the form of these tubes
159 by bending or twisting them. The effect of internal pressure on these tubes tends to cause them to approximate to the circular form of section, and in so doing to straighten the bent tubes, and to untwist the twisted tubes.

160 The figures 2 to 12 inclusive represent some of the infinite variety of sectional forms which may be employed for the purposes of the invention. These tubes may be made of brass or copper, either by flattening cylindrical tubes, or by drawing the tubes at once of the required form, or by stamping or rolling separate pieces of metal, and soldering them together, as in figure 12, or they may be made of iron or steel, glass, caoutchouc or gutta percha, or of any other suitable material, according to the purposes for which they are intended.

161–163 The tubes may be fixed in various ways, as, for instance, by soldering, or by a union joint, as in figure 26, or by driving a ferule outside or inside the tube, as shewn in figures 27 and 28. In these figures the connecting piece T, to which the tube is fixed, serves for connecting it to the steam boiler or other vessel, the pressure in which it is required to ascertain.

164–177 I have described the above instruments as being employed as pressure gauges, and it is evident that they may be employed for ascertaining the pressure of steam, air, gas, water, and fluids in general.

178 [Endorsed:] U. S. Patent Office. Copy made May 13 1905.
90269 / 05.

(Here follow figures 26, 27, 28, and 35, marked pages 179 and 181.)

Supreme Court of the District of Columbia.

MILLETT ET AL.
vs. } C. M. R., Sp. Ex.
COMMISSIONER OF PATENTS.

Decisions of the U. S. Courts.

Court of Appeals of the District of Columbia.

MILLETT AND REED
v.
DUELL, Commissioner of Patents.

Decided May 21, 1901.

1. Anticipation—Subsequently-granted patent—Date of application.—Where a patent showing in the drawing but not describing or claiming the invention was granted to another three days after the appellants' case was filed on an application filed two years before that time, *held* that the appellants' claims were properly rejected.
2. Same—Same—Evidence of the state of the art.—A patent granted after the appellants' filing date, but upon an application filed before, is evidence of the state of the art at the time as shown by the drawings and specifications of the application, and it is a state of the art and not the existence of a patent which determines a party's right to a patent.
3. Same—Patent not claiming invention—Abandonment.—A patent is no less an anticipation because it does not claim the invention, since the failure to claim it simply implies either that he abandoned it to the public or that he regarded it as already well known to the art.
4. Reference—Drawing without description.—Disclosure in a drawing alone if sufficiently plain and clear may be sufficient to show an anticipation of an invention.
5. Anticipation—Disclosure of the invention—Construction of reference.—Where the appellant claims a steam-gage having a tapering end, so that it may be secured in place without soldering, and the reference shows a similar gage, but contains no statement that solder is not used, *held* that the patent is an anticipation and that there is no reason for assuming that the patentee intended to use solder when it is entirely unnecessary.

Mr. William H. Singleton for the appellants.
Mr. W. A. Megrath for the Commissioner.

MORRIS, *J.*:

This is an appeal from a decision of the Commissioner of Patents wherein he refuses to issue letters patent to the appellants.

The alleged invention is stated in seven several issues, not substantially different from each other, and which it is not necessary to consider separately. They are the following:

1. In a steam-gage, the Bourdon tube and the part to which it is secured, the joint between the two being unsoldered and held solely by frictional contact, as explained.
2. In a steam-gage, the Bourdon tube and the part to which it is secured, the joint between the two being unsoldered and held by frictional contact, as explained.
3. In a steam-gage, the Bourdon tube and the part to which it is secured, the joint between the two being unsoldered and held by a frictional binding screw-joint connection, as explained.
4. In a steam-gage, the Bourdon tube and the part to which it is secured, the joint between the two being unsoldered and tapering, as explained.
5. In a steam-gage, the Bourdon tube, D, having the threaded tapered end, *d*, in combination with the head, C, having the correspondingly-threaded tapered opening, c^2, as explained.
6. A Bourdon tube, having a reduced elastic portion and enlarged or reinforced threaded ends, in combination with a gage-case having threaded portions which engage the threaded ends of the tube.
7. The Bourdon tube, D, having the reduced elastic body portion, *d*, and the enlarged or reinforced end portions, in combination with the gage-case having correspondingly-threaded portions.

As stated by the appellants in their application, the alleged—

> invention relates to an improvement in Bourdon-tube springs employed in steam or pressure gages, more especially to the means of connecting the ends of these tubes within a gage.

It seems to consist substantially in dispensing with the soldering of tin, lead, or other fusible material previously used for the connection of the joints, causing the joint to taper, and screwing it more tightly.

The application was filed on February 17, 1900. It was rejected by the primary examiner in an elaborate opinion on reference to a patent issued to one Frederick Lane on February 20, 1900, three days after the filing of the application of the appellants, but which patent had been applied for by Lane upward of two years before. It was contended by the appellants that their application should not be rejected by reference to a patent issued after the filing of their application, in which their alleged invention, if shown at all, was not claimed, and only appeared in the drawing annexed to the patent; and further that this drawing did not show the invention of the appellants. This contention the primary examiner did not sustain; and his ruling was affirmed on appeal both by the board of examiners-in-chief and the Commissioner of Patents. And from the decision of the Commissioner the case has been brought to this court by appeal.

With reference to the first branch of the contention of the appellants, we are satisfied that the tribunals of the Patent Office were entirely right in the conclusion reached by them. If the drawings annexed to the Lane patent fully and satisfactorily show the device claimed by the appellants, and if these drawings were the same that were filed with Lane's application in the first instance—and we must assume that they were the same until the contrary is made to appear—it is very plain that they show anticipation of the invention of the appellants. It is of no consequence that Lane does not include this device among the claims of his own invention. His failure so to do simply implies either that he abandoned it to the public, or that he regarded it as already well known to the art. It does not help the appellants in any manner that he does not claim it.

It is not the fact that a patent was issued to Lane upon his application which constitutes anticipation in this case. Although that patent was issued in so short a time after the application of the appellants that, in view of the usual and necessary course of business in the Patent Office, we might fairly assume that the facts which justified its issue had been satisfactorily shown long before the advent of the appellants to the office, yet the patent of itself would not be sufficient to show anticipation by Lane of the device of the appellants. But the fact which shows such anticipation is the state of the art at the time as evidenced by the drawings and specifications of Lane's application. For it is the condition of the art at the time at which an alleged invention is made, and not the existence of a patent, which in this connection is no more than evidence of the state of the art, which determines whether an invention claimed is actually an invention or not under the patent law. And this state of the art may be shown by a printed book, a periodical publication, a newspaper, anything in fact which can be regarded in law as reasonably sufficient proof of the fact. This we understand to be the rule deduced from reason and the authorities. (See Wright *v.* Yuengling, 69 O. G., 639; 155 U. S., 47.)

This proposition is not seriously, if at all, controverted by the appellants. Indeed, they seem to admit its correctness. Their argument is, that, while a drawing alone, if sufficiently plain and clear, may be sufficient to show an anticipation of the invention, yet the drawing in Lane's patent is not sufficient for that purpose. And this proposition, in view of the previous admission, necessarily means that the Lane drawing is not sufficiently plain and clear to show the invention in question. It is further conceded, however—at all events, it is not denied—that the joints of the Lane drawing have the tapering form which constitutes an element in the invention of the appellants; and so, in the ultimate analysis, the question of anticipation is narrowed down to the inquiry whether in the device shown by the Lane drawing the connection of the joints was effected by soldering or without soldering. The contention of the appellants is that, inasmuch as soldering had been generally used to connect the joints of the devices in previous use, therefore it is to be presumed or assumed that the Lane device also had soldering, notwithstanding that soldering was entirely unnecessary to it. But the specifications of the Lane patent are wholly silent as to soldering; and inasmuch as such soldering was wholly unnecessary to its successful operation, it is not apparent to us why we should assume that to exist which had no reason to exist. If there was in fact a soldering in the device mentioned or shown in the Lane patent, and such soldering rendered that device essentially different from the invention of the appellants, it ought not to have been difficult to adduce some evidence of the fact. Whether, if shown, the fact of soldering would have differentiated the two devices, it is unnecessary for us to determine. The Commissioner of Patents was of the opinion that it would not have that effect.

The Commissioner of Patents has also remarked that the appellants have not availed themselves of the opportunity afforded to them by the rules of the Patent Office to show priority of invention in themselves by filing an affidavit to carry back their date of invention beyond the date of the filing of the Lane application. From their failure so to do it is just to assume that their invention did not antedate the date of the Lane application.

We see no reason to doubt the correctness of the conclusion reached by the tribunals of the Patent Office; and we are of opinion that the decision of the Commissioner of Patents should be affirmed.

The clerk of the court will certify this opinion, and the proceedings in the cause in this court to the Commissioner of Patents according to law. And it is so ordered.

229 *Memorandum.*

Defendant's Exhibit (1) filed, November 26, 1902; is a catalogue of the Crosby Steam Gage & Valve Co., and is transmitted herewith.

230 *Stipulation of Counsel as to Proof.*

Filed November 26, 1902.

In the Supreme Court of the District of Columbia.

JOSHUA H. MILLETT, SAMUEL G. REED, and The Crosby Steam Gage and Valve Company, Plaintiffs, *vs.* FREDERICK I. ALLEN, Commissioner of Patents, Defendant.	No. 23126. Eq. Doc. 52.

In order to avoid the necessity of calling other witnesses, it is hereby stipulated by and between counsel, and at the suggestion of the counsel for the defendant, that the witnesses Johnson and Freeman, if recalled, would testify that it was not their intention to convey any idea or suggestion, when testifying, that the railroad companies which bought Crosby's new gage removed other gages which were in good condition from their engines to substitute the new gage, or that the gages which were given to the Crosby Company in exchange were in good condition.

RALPH W. FOSTER,
Counsel for Plaintiffs.
JOHN M. COIT,
Counsel for Defendant.

231 *Opinion of Justice Gould.*

Filed March 11, 1905.

In the Supreme Court of the District of Columbia.

JOSHUA H. MILLETT, SAM'L G. REED, and The Crosby Steam Gage & Valve Company, Plaintiffs, *vs.* FREDERICK I. ALLEN, Commissioner of Patents, Defendants.	Equity. No. 23126.

This is a bill in equity filed under the provisions of section 4915 R. S. U. S. which gives the applicant for a patent, whose application has been refused by the Commissioner of Patents, the right to proceed in equity to establish his claim to a patent for his invention, and to that end to produce all competent evidence bearing upon his said invention. The history of the case is substantially as follows:

The complainants, Millett and Reed, as joint inventors, filed in the Patent Office on June 12, 1899, application No. 720,288, for a patent upon a steam pressure gage. Their claims were rejected and on January 16, 1900, they filed a second application for the same device with amended claims. The second application was rejected, and on February 17, 1900, they filed a third application with amended claims. A copy of that application is found on pages 2 to 7 and page 22, of the transcript of record of the Court of Appeals, filed as an exhibit in this case. These claims having been rejected by the examiner, appeal was taken to the examiners in chief, who affirmed the decision; appeal was then taken to the Commissioner of Patents, and from his decision to the Court of Appeals of
232 the District, which affirmed the Commissioner, the opinion of the latter tribunal being reported in 18 D. C. App. 186. The present bill seeks a decree adjudging that the complainants are entitled to a patent upon one or more of the identical claims which have been passed upon by the tribunals above recited. This proceed-

ing differs from that leading up to the final rejection of all the claims in that in this the complainants, as they had the right to do under the statute, have taken voluminous testimony in support of their contentions.

As I have stated, the alleged invention relates to steam pressure gages. Such gages have a dial or face plate like a clock, graduated and marked to indicate various pressures and a hand or pointer which is moved around that dial by the pressure of the steam. The steam pasess into what is known as a Bourdon tube, so called from the name of the inventor. This tube is flattened, thin and circular. One end is fastened in a socket which is screwed into the boiler, and the other end is closed with a plug. The admission of steam from the boiler into the tube tends to straighten it by reason of and in proportion to the pressure. One end of the tube being fixed, the other moves, and that free end is connected by gearing to the spindle upon which the hand or pointer is mounted, so that the motion of the free end of the tube moves the hand and thus indicates on the dial the amount of pressure.

The complainants' alleged invention consists in the means for fastening the Bourdon tube to the socket which is attached to the
boiler and the means for fastening in place the plug at the
233 free end of the tube. Their specific contention is set forth in
their bill as follows:

"The invention consists in, or is the result of, taking a piece of the ordinary brass tube of commerce and turning it, with the exception of its ends, in a lathe to the thickness adapted to the uses intended in a pressure gage. The ends of the tube are left to their original thickness and are cut by a taper thread for attachment to the tubular head and registering mechanism as aforesaid. The tube is then flattened throughout the turned portion, and curved to the form required. By means of these taper threads a joint is secured which is both firm and tight, though no solder is used, even when subjected to a very high degree of heat and steam pressure." The bill further recites that prior to the invention in question the Bourdon tube spring employed in all steam gages, was a brass tube of uniform thickness flattened throughout its length, and it was the custom to attach the flattened ends of this tube to the tubular head of the gage and to the registering mechanism of the gage by fitting one end of the tube over a projection of the tubular head, and the other end over a tip connected with the registering mechanism, and then soldering the joints. It further states that this practice is satisfactory where the steam pressure is low and the tube itself protected against the introduction of steam. But when a high pressure is required to be measured, it is found that the severe heat melts the solder. It also states that for many years the complainants have been seeking a method of attaching a Bourdon tube spring without the use of solder, and avers that they were unsuccessful until the device in question was discovered. Their claims are as follows:

234 1. In a steam gage, the Bourdon tube and the part to which it is secured, the joint between the two being onsoldered and held solely by frictional contact, as explained.

2. In a steam-gage, the Bourdon tube and the part to which it is secured, the joint between the two being unsoldered and held by frictional contact, as explained.

3. In a steam gage, the Bourdon tube and the part to which it is secured, the joint between the two being unsoldered and held by a frictional binding screw-joint connection as explained.

4. In a steam-gage, the Bourdon tube and the part to which it is secured, the joint between the two being unsoldered and tapering, as explained.

5. In a steam-gage, the Bourdon tube D, having the threaded tapered end, *d*, in combination with the head, C, having the correspondingly-threaded tapered opening C^2, as explained.

6. A Bourdon tube, having a reduced elastic portion and enlarged or reinforced threaded ends, in combination with a gage-case having threaded portions which engage the threaded ends of the tube.

7. The Bourdon tube D, having the reduced elastic body portion, *d*, and the enlarged or reinforced end portions, in combination with the gage-case having correspondingly-threaded portions.

The defendant filed an answer denying that complainants, Millett and Reed were "the original, first and joint inventors of the improvements in Bourdon tube springs employed in steam or pressure gages" and alleging that all the material parts of the device were fully set forth in ten patents, described by name of inventor, serial number and date, which ante-dated complainants' application.

Before considering the voluminous testimony taken by appellants, it is instructive to examine the decision of the Court of Appeals to which reference has been made. It was there held that the invention of plaintiffs was anticipated by the application for a patent made by one Lane, which showed the device of said plaintiffs. And this decision would be binding upon the court, except for a statement therein that "if there was in fact a soldering in the device mentioned or shown in the Lane patent, and such soldering rendered that device essentially different from the invention of 235 the appellants, it ought not to have been difficult to adduce some evidence of the fact. Whether, if shown, the fact of soldering would have differentiated the two devices, it is unnecessary for us to determine. The Commissioner of Patents was of the opinion that it would not have that effect."

So far as the fact of the use of soldering in the Lane patent is concerned, it may be taken as settled by the testimony that solder was intended to be used. (See Lane's testimony, page 93 of record.)

Conceding, therefore, that there is testimony to the effect that Lane's patent involved the use of solder, it becomes necessary to consider the addional testimony taken by complainants upon which reliance is had to show invention. Briefly summarized, this is to the following effect: that prior to February, 1899, the only Bourdon

tube-spring employed in steam-pressure gages was a flat one made of brass secured to the gage socket and to the registering mechanism by a threadless, soldered joint; that under high pressure soldered joints are apt to melt and that for many years the complainant company (with which complainants Millett and Reed are officially connected) had been experimenting with a view to doing away with solder; that in February 1899, Millett and Reed took a piece of cylindrical brass tubing, turned down and flattened its central portion, furnished its cylindrical ends with tapered threads, and screwed it to the gage socket and to the registering mechanism of the gage. No solder was used and the tube-spring thus made worked successfully under high pressure; that there is a large and growing demand for the gages thus equipped and they are being adopted by
236 numerous railroads, supplanting gages having soldered joints.

It will thus be seen that plaintiffs' claim to invention rests upon the following elements:

1st. Turning down a round brass tube so that it shall have its central portion flattened, leaving cylindrical ends.

2nd. Furnishing these cylindrical ends with tapered threads; the whole to form a steam-tight Bourdon tube-spring for a steam gage without the use of solder.

In this connection, the testimony of one of the plaintiffs (Millett) becomes important:

"At the time you conceived this idea, did you know of any Bourdon tube having thickened screw threaded ends and then flattened middle portions?" A. Yes; the Bourdon tube made of steel such as was used in the hydraulic gage.

Q. Had you used these tubes long in your factory? A. Ever since the company was organized in 1875, in the same way and just as we do now.

Q. When Reed suggested tapering the screw thread, was that the first time that you had ever heard of tapered threads to make a steam tight joint? A. No.

Q. You knew, then, that such threads would make a steam-tight joint? A. Yes.

Q. Had your company been using tapered screw threads on articles manufactured by it for use in connection with steam boilers so that a steam tight joint would be secured? A. We had.

237 Q. How long have you used such threads? A. Ever since the company has been in business.

Q. Do you use solder in those devices to make the joints steam tight? A. Probably not." (Record p. 34.)

It is thus evident that what Millett and Reed did, and what they seek to have patented, is to make the tube for steam gages in the same form in which they had been making for many years, a similar tube for hydraulic gages, *i. e.* with flattened center and cylindrical ends; and to insert in the cylindrical ends the tapering screw joints which they had likewise for many years used on articles where a steam-tight joint was desired. Does this constitute invention?

It is well-settled that a mere change in material does not involve invention. Hotchkiss *vs.* Greenwood, 11 Howard, 248.

This would seem to cover the substitution of the flattened brass tube with cylindrical ends in the steam gage for the similar steel tube used in the hydraulic gage.

Did the adaptation of the tapering-screw joint, used by plaintiffs on other articles manufactured by them where a steam-tight joint was required, to the ends of the tube in the steam gage, where a similar joint was needed, involve invention, or was it merely an exercise of mechanical skill?

It does not seem to admit of doubt that the use of the tapered screw threads in the Bourdon tube was an obvious mechanical expedient involving no exercise of the inventive faculty. Both plaintiffs, Millett and Reed testify that for years prior to their 238 alleged invention they had been using such threads on articles manufactured for use in connection with steam boilers where a steam tight joint was desired. They desired a steam-tight joint without solder on a Bourdon tube in a steam-gage and they used the tapered screw joint they had been accustomed to use in such exigencies. The *form* of the tube they already used in their hydraulic gages; the tapered joint they used whenever a steam-tight joint was required. What more than mechanical skill was required or necessary to combine the two features in a steam gage? The case seems to fall clearly within the principle laid down in Penn. Ry. Co. *v.* Locomotive Engine Safety Truck Co. 110 U. S. 490, in which Mr. Justice Gray says: "It is settled by many decisions of this court, which it is unnecessary to quote from or refer to in detail, that the application of an old process or machine to a similar or analogous subject, with no change in the manner of application and no result substantially distinct in its nature, will not sustain a patent, even if the new result has not been before contemplated." And the English case of Harwood *v.* Great Northern Ry. Co. 11 H. L. Cas. 654, cited by Mr. Justice Gray on this point seems to bear a very close analogy to the case at bar.

This conclusion renders it unnecessary to discuss the numerous references cited by counsel for the Commissioner of Patents. It may be observed, however, that the English patent of Cowper, dated Dec. 5, 1849, and offered as a reference, as interpreted by Reed, one of the complainants, in his testimony at p. 71, shows a steam-tight joint (Exhibit 24). And that tapered threads and union joints are 239 recognized mechanical equivalents for making steam-tight joints is apparent from the fact that these plaintiffs show both as alternative forms in their present application for patent.

This case has been argued for complainants with great ability and earnestness and has received thorough consideration; but the court is unable to reach the conclusion that the elements added to the steam gage either singly or in combination, rise above the limit of mechanical skill. I will therefore sign a decree dismissing the bill.

ASHLEY M. GOULD, *Justice.*

Decree Dismissing Bill, Appeal, &c.

Filed April 24, 1905.

In the Supreme Court of the District of Columbia.

JOSHUA H. MILLETT, SAMUEL G. REED, and The Crosby Steam Gage and Valve Company, Plaintiffs, *vs.* FREDERICK I. ALLEN, Commissioner of Patents, Defendants.	No. 23126. Equity.

This cause came on to be heard and was argued by R. W. Foster, Esq., and W. H. Singleton, Esq., of counsel for complainants, and John M. Coit, Esq., of counsel for defendant, and upon consideration thereof it is adjudged, ordered, and decreed that the bill of complaint herein should be and the same is hereby dismissed at the costs of the complainants. The complainants having prayed 240 an appeal to the Court of Appeals of the District of Columbia from the judgment of this court dismissing the bill of complaint, such appeal is hereby allowed and the bond is fixed in the penalty of one hundred dollars, in lieu of which a deposit of one hundred dollars may be made.

ASHLEY M. GOULD, *Justice.*

April 24, 1905.

Memorandum.

April 24, 1905.—$100.00 deposited by appellant- in lieu of appeal bond.

Order for Preparation of Record.

Filed April 24, 1905.

In the Supreme Court of the District of Columbia, the 24th Day of April, 1905.

MILLETT, REED, & CROSBY STEAM GAGE & Valve Co. *vs.* F. I. ALLEN, Commissioner of Patents.	Equity. No. 23126.

The clerk of said court will prepare and transmit to Court of Appeals the following transcript of the record: Feb. 8, 1902, bill;

241 March 25, 1902, answer; April 10, 1902, replication; November 26, 1902, depositions of all witnesses and stipulation and paper exhibits; March 11, 1905, opinion; April 24, 1905, decree.

W. H. SINGLETON,
Attorney for Complainants.

242 Supreme Court of the District of Columbia.

UNITED STATES OF AMERICA, District of Columbia, } ss:

I, John R. Young, clerk of the supreme court of the District of Columbia, hereby certify the foregoing pages, numbered from 1 to 151, inclusive, and Defendant's Exhibit (1), transmitted herewith, to be a true and correct transcript of the record, as per directions of counsel herein filed, copy of which is made part of this transcript, in cause No. 23126, in equity, wherein Joshua H. Millett *et al.* are complainants, and F. I. Allen, Commissioner of Patents, is defendant, as the same remains upon the files and of record in said court.

In testimony whereof, I hereunto subscribe my name and affix the seal of said court, at the city of Washington, in said District, this 1st day of June, A. D. 1905.

Seal Supreme Court of the District of Columbia.

JOHN R. YOUNG, *Clerk.*

243 Court of Appeals, District of Columbia, —— Term, 1905.

JOSHUA H. MILLETT, SAMUEL G. REED, and THE CROSBY Steam Gage & Valve Company, Appellants,
v.
F. I. ALLEN, Commissioner of Patents.
} No. 1563.

Stipulation as to Printing Record.

In the above entitled cause it is hereby stipulated that the record, as certified from the lower court, shall be printed, except:

"Defendant's Exhibit (1),"

Complainants' Exhibit Transcript of Record, No. 172 patent appeal docket, and

British patent of Cowper, No. 12,889, page 136, of 1849, except that of this patent the following shall be printed:

Drawing, figures 26, 27, 28 and 35.

Specification:

Page 2, line 20, to bottom of said page, and page 3, first 4 lines.

Page 4, line 6, to line 14, "intended," inclusive.

Page 5, line 10, "The," to line 16, "ascertain," inclusive.
Page 8, line 11, "I," to line 14, "general," inclusive.

W. H. SINGLETON,
Solicitor for Appellants.
JOHN M. COIT,
Counsel for Appellee.

(Indorsed:) No. 1563. Joshua H. Millett, *et al.*, appellants, *v.* F. I. Allen, Commissioner of Patents. Stipulation as to printing of record. Court of Appeals, District of Columbia. Filed Jun- 16, 1905. Henry W. Hodges, clerk.

244 In the Court of Appeals of the District of Columbia.

JOSHUA H. MILLETT, SAMUEL G. REED, and THE CROSBY Steam Gage and Valve Company, Complainants,
vs.
F. I. ALLEN, Commissioner of Patents, Defendant.
No. 1563.

Stipulation as to Printing.

It is stipulated and agreed by and between counsel that of all the United States patents cited in the answer of the defendant and introduced in evidence the following only shall be printed.

Ashcroft, September 8, 1857, # 18,129, drawing only,
Lane, February 20, 1900. 643,876.

W. H. SINGLETON,
Counsel for Complainants.
JOHN M. COIT,
Counsel for Defendant.

(Endorsed:) No. 1563. Joshua H. Millett, *et al.*, appellants, *vs.* F. I. Allen, Commissioner of Patents. Stipulation as to printing. Court of Appeals District of Columbia. Filed Aug. 3, 1905 Henry W. Hodges, clerk.

Endorsed on cover: District of Columbia supreme court. No. 1563. Joshua H. Millett *et al.*, appellants, *vs.* F. I. Allen, Commissioner of Patents. Court of Appeals, District of Columbia. Filed Jun- 2, 1905. Henry W. Hodges, clerk.